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ABSTRACT

A guide for advancement of Navy personnel in the Aviation Boatswain's Mate H (ABH) rating is provided in this self-study training manual. The chapters outline the qualifications and responsibilities of Aviation Boatswains involved in aircraft handling equipment, aircraft handling, aircraft crashes, firefighting, crew entrapment, shipboard firefighting, and administration. There are extensive diagrams, drawings, and photographs. (KP)

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AVIATION

BOATSWAIN'S MATE H 1 & C

BUREAU OF NAVAL PERSONNEL

RATE TRAINING MANUAL NAVPERS 10303-B

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PREFACE

This Navy Rate Training Manual is one of a series of training manuals prepared especially for men of the Navy studying for advancement in the Aviation Boatswain's Mate H (ABH) rating. This manual was designed to be a self-study manual.

The predominant factor in the selection of the contents of this training manual has been the 1969 revision of the Manual of Qualifications for Advancement, NavPers 18068 (Series), as it relates to the ABH rating at the first class and chief petty officer levels.

Aviation Boatswain's Mate H 1 & C was prepared by the Navy Training Publications Center, Millington, Tennessee, for the Bureau of Naval Personnel. Credit for technical assistance is given to the Aviation Boatswain's Mate School, Lakehurst, New Jersey, the Naval Aviation Integrated Logistic Support Center, Patuxent River, Maryland, and the Naval Air Systems Command.

1971 Edition

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THE UNITED STATES NAVY

GUARDIAN OF OUR COUNTRY

The United States Navy is responsible for maintaining control of the sea and is a ready force on watch at home and overseas, capable of strong action to preserve the peace or of instant offensive action to win in war.

It is upon the maintenance of this control that our country's glorious future depends; the United States Navy exists to make it so.

WE SERVE WITH HONOR

Tradition, valor, and victory are the Navy's heritage from the past. To these may be added dedication, discipline, and vigilance as the watchwords of the present and the future.

At home or on distant stations we serve with pride, confident in the respect of our country, our shipmates, and our families.

Our responsibilities sober us; our adversities strengthen us.

Service to God and Country is our special privilege. We serve with honor.

THE FUTURE OF THE NAVY

The Navy will always employ new weapons, new techniques, and greater power to protect and defend the United States on the sea, under the sea, and in the air.

Now and in the future, control of the sea gives the United States her greatest advantage for the maintenance of peace and for victory in war.

Mobility, surprise, dispersal, and offensive power are the keynotes of the new Navy. The roots of the Navy lie in a strong belief in the future, in continued dedication to our tasks, and in reflection on our heritage from the past.

Never have our opportunities and our responsibilities been greater.

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READING LIST

USAFI TEXTS

United States Armed Forces Institute (USAFI) courses for additional reading and study are available through your Educational Services Officer.* The following courses are recommended:

D 700 General Aeronautics

E 275 General Science I

E 276 General Science II

*"Members of the United States Armed Forces Reserve components, when on active duty, are eligible to enroll for USAFI courses, services, and materials if the orders calling them to active duty specify a period of 120 days or more."

CHAPTER 1

AVIATION BOATSWAIN'S MATE H RATING

The requirements for advancement are many. Experience has proved that one requirement for advancement is study. This is essential if the petty officer is to keep up with a rapidly changing Navy. Study relates to those efforts necessary to acquire related knowledge from both the written word and from the practical aspects of a job. For the ABH the knowledge required for advancement is acquired from the study of training manuals and other publications, and from on-the-job training and practical experience.

This Rate Training Manual is designed to aid the ABH2 in preparing for advancement to ABH1 and the ABH1 in preparing for ABHC, based primarily on the professional requirements or qualifications for ABH1 and ABHC, as contained in the Manual of Qualifications for Advancement, NavPers 18068 (Series). For examination purposes, this manual should be studied in conjunction with ABH 3 & 2, NavPers 10300-B since some material on the examination for advancement may be thoroughly explained in that publication and not repeated in this manual. In preparation for examination, Military Requirements for Petty Officer 1 & C, NavPers 10057-B, which covers the military requirements for all senior petty officers, should also be studied.

ENLISTED RATING STRUCTURE

The present enlisted rating structure includes two types of ratings: general ratings and service ratings.

GENERAL RATINGS are designed to provide paths of advancement and career development. A general rating identifies a broad occupational field of related duties and functions requiring similar aptitudes and qualifications. General ratings provide the primary means used to identify billet requirements and personnel qualifications. Some general ratings include service ratings; others do not. Both Regular Navy and Naval Reserve personnel may hold general ratings.

Subdivisions of certain general ratings are identified as SERVICE RATINGS. These service ratings identify areas of specialization within the scope of a general rating. Service ratings are established in those general ratings in which specialization is essential for efficient utilization of personnel. Although service ratings can exist at any petty officer level, they are most common at the PO3 and PO2 levels. Both Regular Navy and Naval Reserve personnel may hold service ratings.

ABH RATING

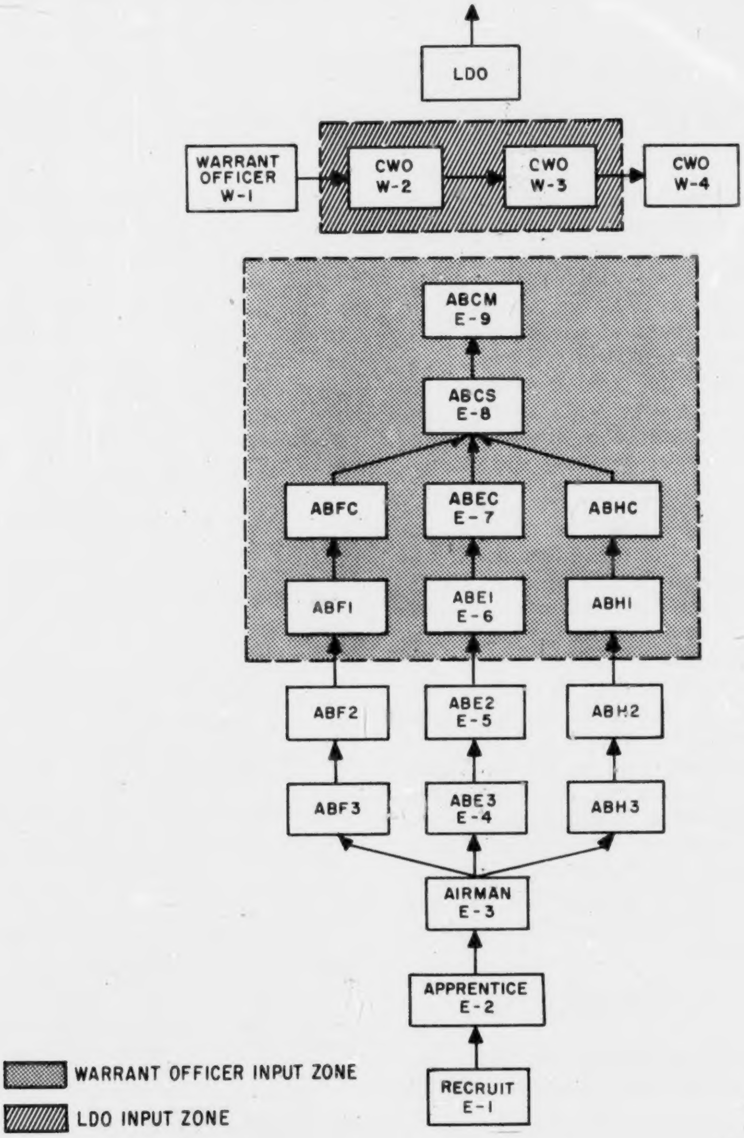
The ABH rating is a service rating and is included in Navy Occupational Group IX (Aviation). The general rating, AB, applies at the E-8 and E-9 levels. (See fig. 1-1).

The Manual of Qualifications for Advancement, NavPers 18068 (Series), states that ABH's are responsible for the movement and spotting of aircraft, both ashore and afloat; operate and service ground handling and hoisting equipment; and perform aircraft crash rescue firefighting, crash removal, and damage control duties. ABH's also supervise the securing of aircraft and equipment and perform duties in connection with launching and recovery of aircraft.

The ABH1 must be qualified to supervise and conduct inventories and maintain custody records, prepare equipment failure reports, direct flight deck damage control parties, and know the procedures and equipment needed for jettisoning aircraft and equipment.

In addition to the above listed requirements for ABH1, the ABHC must inspect work areas, tools, and equipment to detect potentially hazardous and unsafe conditions and take corrective action, and screen defective components for feasibility of repair.

Along with the necessary tours of sea duty, a wide variety of assignments ashore is available to the ABH. In addition to air station assignments which usually entail a billet in air terminal duties or crash-rescue duties, the ABH1 and ABHC are eligible for assignment to instructor duty.


LDO
WARRANT OFFICER W-1
CWO W-2
CWO W-3
CWO W-4
ABCM E-9
ABCS E-8
ABFC
ABEC E-7
ABHC
ABFI
ABEI E-6
ABHI
ABF2
ABE2 E-5
ABH2
ABF3
ABE3 E-4
ABH3
AIRMAN E-3
APPRENTICE E-2
RECRUIT E-1
▨ WARRANT OFFICER INPUT ZONE
▨ LDO INPUT ZONE

AB.1

Figure 1-1.—Paths of advancement.

Some of the instructor billets available to ABH's are as follows:

1. Aviation Boatswain's Mate School, NATTU, Lakehurst, New Jersey.

2. Aviation Familiarization School, NATTC, Memphis, Tennessee.

Instructor billets are normally filled on a voluntary basis. Detailed information concerning assignment to instructor duty is contained in the Enlisted Transfer Manual, NavPers 15909 series.

Chief Aviation Boatswain's Mates are eligible for assignment to duty with the Navy Training Publications Center (NTPC), NAS Memphis, Millington, Tennessee, as Technical Writers. CPO's assigned to NTPC assist in the preparation and revision of Rate Training Manuals for the Group IX (Aviation) ratings.

Chief Aviation Boatswain's Mates are also eligible for assignment to duty with the Naval Examining Center, Great Lakes, Illinois, as Item Writers. CPO's assigned to the Examining Center assist in the preparation of Navy-wide advancement examinations for enlisted personnel.

There are also a number of special programs and projects to which enlisted personnel may be assigned. For a listing of special programs and projects, reference should be made to the Enlisted Transfer Manual. Others are also announced from time to time in BuPers Notices.

Personnel may indicate their desire for assignment to a specific program or project by indicating it in the "remarks" block of their Rotation Data Card.

As a petty officer, you are already aware of the importance of the ABH rating to naval aviation. Naval aviation depends upon the ABH rating for the efficient operation of its aircraft carriers. Thus, the ABH's job involves great responsibilities, and from the lowest level up, he must possess greater technical skills than ever before.

When advanced to ABH1 or ABHC, even more responsibilities are to be yours. As a senior petty officer, you must possess more than technical skills. You must assume greater responsibility not only for your own work, but also for the work of others who serve under you. Briefly, the ABH1 and ABHC must be a skilled supervisor, inspector, and instructor, as well as an accomplished military leader. Senior petty officers are therefore vitally concerned with the Naval Leadership Program.

As a result of the Naval Leadership Program, a considerable amount of material related to naval leadership for the senior petty officer is available. Studying this material will make you aware of your many leadership responsibilities as a senior petty officer and will also be of great help in developing leadership qualities. It will not in itself, however, make you a good leader. Leadership principles can be taught, but a good leader acquires that quality only through hard work and practices.

As you study this material containing leadership traits, keep in mind that probably none of our most successful leaders possessed all of these traits to a maximum degree, but a weakness in some traits was more than compensated for by strength in others. Critical self-evaluation will enable you to realize the traits in which you are strong, and to capitalize on them. At the same time, you must constantly strive to improve on the traits in which you are weak.

Your success as a leader will be decided, for the most part, by your achievements in inspiring others to learn and perform. This is best accomplished by personal example.

ADVANCEMENT

By this time, you are probably well aware of the personal advantages of advancement—higher pay, greater prestige, more interesting and challenging work, and the satisfaction of getting ahead in your chosen career. By this time, also, you have probably discovered that one of the most enduring rewards of advancement is the training you acquire in the process of preparing for advancement.

The Navy also profits by your advancement. Highly trained personnel are essential to the functioning of the Navy. By advancement, you increase your value to the Navy in two ways: First, you become more valuable as a technical specialist, and thus make far-reaching contributions to the entire Navy; and second, you become more valuable as a person who can supervise, lead, and train others.

Since you are studying for advancement to PO1 or CPO, you are probably already familiar with the requirements and procedures for advancement. However, you may find it helpful to read the following sections. The Navy does not stand still. Things change all the time, and it is possible that some of the requirements have changed since the last time you went up for advancement. Furthermore, you will be responsible for training others for advancement; therefore, you will need to know the requirements in some detail.

HOW TO QUALIFY FOR ADVANCEMENT

To qualify for advancement, a person must:

1. Have a certain amount of time in grade.
2. Complete the required Rate Training Manuals either by demonstrating a knowledge of the material in the manual by passing a locally prepared and administered test or by passing the Enlisted Correspondence Course based on the Rate Training Manual.

3. Demonstrate the ability to perform all the PRACTICAL requirements for advancement by completing applicable portions of the Record of Practical Factors, NavPers 1414/1.

4. Be recommended by your commanding officer, after the petty officers and officers supervising your work have indicated that they consider you capable of performing the duties of the next higher rate.

5. Demonstrate KNOWLEDGE by passing a written examination on (a) military requirements, and (b) professional qualifications.

Some of these general requirements may be modified in certain ways. Figure 1-2 gives an overall view of the requirements for advancement of active duty personnel; figure 1-3 gives this information for inactive duty personnel.

Remember that the requirements for advancement can change. Check with your educational services office to be sure that you know the most recent requirements.

When you are training lower rated personnel, it is a good idea to point out that advancement is not automatic. Meeting all the requirements makes a person ELIGIBLE for advancement, but it does not guarantee his advancement. Such factors as the score made on the written examination, length of time in service, performance marks, and quotas for the rating enter into the final determination of who will actually be advanced.

HOW TO PREPARE FOR ADVANCEMENT

What must you do to prepare for advancement? You must study the qualifications for advancement, work on the practical factors, study the required Rate Training Manuals, and study other material that is required. You will need to be familiar with the following:

1. Manual of Qualifications for Advancement, NavPers 18068 (Series).
2. Record of Practical Factors, NavPers 1414/1.
3. Training Publications for Advancement, NavPers 10052 (Series).
4. Applicable Rate Training Manuals and their companion Enlisted Correspondence Courses.

Collectively, these documents make up an integrated training package tied together by the qualifications. The following paragraphs describe these materials and give some information on how each one is related to the others.

"Quals" Manual

The Manual of Qualifications for Advancement, NavPers 18068 (Series), gives the minimum requirements for advancement to each rate within each rating. This manual is usually called the "Quals" Manual, and the qualifications themselves are often called "quals." The qualifications are of two general types: (1) military requirements, and (2) professional or technical qualifications. Military requirements apply to all ratings rather than to any one rating alone. Professional qualifications are technical or professional requirements that are directly related to the work of each rating.

Both the military requirements and the professional qualifications are divided into subject matter groups. Then, within each subject matter group, they are divided into PRACTICAL FACTORS and KNOWLEDGE FACTORS.

The qualifications for advancement and a bibliography of study materials are available in your educational services office. The "Quals" Manual is changed more frequently than Rate Training Manuals are revised. By the time you are studying this training manual, the "quals" for your rating may have been changed. Never trust any set of "quals" until you have checked the change number against an UP-TO-DATE copy of the "Quals" Manual.

In training others for advancement, emphasize these three points about the "quals":

1. The "quals" are the MINIMUM requirements for advancement. Personnel who study MORE than the required minimum will have a great advantage when they take the written examinations for advancement.

2. Each "qual" has a designated rate level—chief, first class, second class, or third class. You are responsible for meeting all "quals" specified for the rate level to which you are seeking advancement AND all "quals" specified for lower rate levels. This manual is written to provide additional or add-on information to that contained in ABH 3 & 2, NavPers 10300-B, and it is recommended that the material in the 3 & 2 manual be reviewed.

3. The written examinations for advancement will contain questions relating to the practical factors AND to the knowledge factors of BOTH the military requirements and the professional qualifications.

REQUIREMENTS*	E1 to E2	E2 to E3	#† E3 to E4	#E4 to E5	† E5 to E6	† E6 to E7	† E7 to E8	† E8 to E9
SERVICE	4 mos. service or completion of	6 mos. as E-2.	6 mos. as E-3	12 mos. as E-4	24 mos. as E-5.	36 mos. as E-6. 8 years total enlisted service.	36 mos as E-7. 8 of 11 years total service must be enlisted.	24 mos. as E-8. 10 of 13 years total service must be enlisted.
SCHOOL	Recruit Training.		Class A for PR3, DT3, PT3, AME 3, HM 3, PN 3, FTB 3, MT 3.			Class B for AGC MUC, MNC.††		
PRACTICAL FACTORS	Locally prepared check-offs.	Record of Practical Factors, NavPers 1414/1, must be completed for E-3 and all PO advancements.						
PERFORMANCE TEST			Specified ratings must complete applicable performance tests before taking examinations.					
ENLISTED PERFORMANCE EVALUATION	As used by CO when approving advancement.		Counts toward performance factor credit in advancement multiple.					
EXAMINATIONS**	Locally prepared tests.	See below.	Navy-wide examinations required for all PO advancements.				Navy-wide, selection board.	
RATE TRAINING MANUAL (INCLUDING MILITARY REQUIREMENTS)		Required for E-3 and all PO advancements unless waived because of school completion, but need not be repeated if identical course has already been completed. See NavPers 10052 (current edition).					Correspondence courses and recommended reading. See NavPers 10052 (current edition).	
AUTHORIZATION	Commanding Officer		Naval Examining Center					

* All advancements require commanding officer's recommendation.

† 1 year obligated service required for E-5 and E-6; 2 years for E-7, E-8 and E-9.

# Military leadership exam required for E-4 and E-5.

** For E-2 to E-3, NAVEXAMCEN exams or locally prepared tests may be used.

†† Waived for qualified EOD personnel.

Figure 1-2.—Active duty advancement requirements.

REQUIREMENTS *	E1 to E2	E2 to E3	E3 to E4	E4 to E5	E5 to E6	E6 to E7	E8	E9
TOTAL TIME IN GRADE	4 mos.	6 mos.	6 mos.	12 mos.	24 mos.	36 mos. with total 8 yrs service	36 mos. with total 11 yrs service	24 mos. with total 13 yrs service
TOTAL TRAINING DUTY IN GRADE †	14 days	14 days	14 days	14 days	28 days	42 days	42 days	28 days
PERFORMANCE TESTS			Specified ratings must complete applicable performance tests before taking examination.					
DRILL PARTICIPATION	Satisfactory participation as a member of a drill unit in accordance with BUPERSINST 5400.42 series.							
PRACTICAL FACTORS (INCLUDING MILITARY REQUIREMENTS)	Record of Practical Factors, NavPers 1414/1, must be completed for all advancements.							
RATE TRAINING MANUAL (INCLUDING MILITARY REQUIREMENTS)	Completion of applicable course or courses must be entered in service record.							
EXAMINATION	Standard Exam		Standard Exam required for all PO Advancements. Also pass Military Leadership Exam for E-4 and E-5.				Standard Exam, Selection Board.	
AUTHORIZATION	Commanding Officer		Naval Examining Center					

* Recommendation by commanding officer required for all advancements.

† Active duty periods may be substituted for training duty.

Figure 1-3.—Inactive duty advancement requirements.

Record of Practical Factors

Before you can take the Navy-wide examination for advancement, there must be an entry in your service record to show that you have qualified in the practical factors of both the military requirements and the professional qualifications. A special form known as the Record of Practical Factors, NavPers 1414/1 (plus the abbreviation of the appropriate rating), is used to keep a record of your practical factor qualifications. The form lists all practical factors, both military and professional. As you demonstrate your ability to perform each practical factor, appropriate entries are made in the DATE and INITIALS columns.

As a PO1 or CPO, you will often be required to check the practical factor performance of lower rated personnel and to report the results to your supervising officer.

As changes are made periodically to the "Quals" Manual, new forms of NavPers 1414/1 are provided when necessary. Extra space is allowed on the Record of Practical Factors for entering additional practical factors as they are published in changes to the "Quals" Manual. The Record of Practical Factors also provides space for recording demonstrated proficiency in skills which are within the general scope of the rating but which are not identified as minimum qualifications for advancement. Keep this in mind when you are training and supervising other personnel. If a person demonstrates proficiency in some skill which is not listed in the "quals" but which is within the general scope of the rating, report this fact to the supervising officer so that an appropriate entry can be made in the Record of Practical Factors.

When you are transferred, the Record of Practical Factors should be forwarded with your service record to your next duty station. It is a good idea to check and be sure that this form is actually inserted in your service record before you are transferred. If the form is not in your record, you may be required to start all over again and requalify in practical factors that have already been checked off. You should also take some responsibility for helping lower rated personnel keep track of their practical factor records when they are transferred.

A second copy of the Record of Practical Factors should be made available to each man in pay grades E-2 through E-8 for his personal record and guidance.

The importance of NavPers 1414/1 cannot be overemphasized. It serves as a record to indicate to the petty officers and officers supervising your work that you have demonstrated proficiency in the performance of the indicated practical factors and is part of the criteria utilized by your commanding officer when he considers recommending you for advancement. In addition, the proficient demonstration of the applicable practical factors listed on this form can aid you in preparing for the examination for advancement. Remember that the knowledge aspects of the practical factors are covered in the examination for advancement. Certain knowledge is required to demonstrate these practical factors and additional knowledge can be acquired during the demonstration. Knowledge factors pertain to that knowledge which is required to perform a certain job. In other words, the knowledge factors required for a certain rating depend upon the jobs (practical factors) that must be performed by personnel of that rating. Therefore, the knowledge required to proficiently demonstrate these practical factors will definitely aid you in preparing for the examination for advancement.

NavPers 10052

Training Publications for Advancement, NavPers 10052 (Series) is a very important publication for anyone preparing for advancement. This publication/bibliography lists required and recommended Rate Training Manuals and other reference material to be used by personnel working for advancement. NavPers 10052 (Series) is revised and issued once each year by the Bureau of Naval Personnel. Each revised edition is identified by a letter following the NavPers number; be SURE you have the most recent edition.

The required and recommended references are listed by rate level in NavPers 10052 (Series). It is important to remember that you are responsible for all references at lower rate levels, as well as those listed for the rate to which you are seeking advancement.

Rate Training Manuals that are marked with an asterisk (*) in NavPers 10052 (Series) are MANDATORY at the indicated rate levels. A mandatory training manual may be completed by (1) passing the appropriate Enlisted Correspondence Course that is based on the mandatory training manual; (2) passing locally prepared tests based on the information given in the mandatory training manual; or (3) in some cases, successfully completing an appropriate Navy school.

When training personnel for advancement, do not overlook the section of NavPers 10052 (Series) which lists the required and recommended references relating to the military requirements for advancement. All personnel must complete the mandatory military requirements training manual for the appropriate rate level before they can be eligible to advance. Also, make sure that personnel working for advancement study the references listed as recommended but not mandatory in NavPers 10052 (Series). It is important to remember that ALL references listed in NavPers 10052 (Series) may be used as source material for the written examinations, at the appropriate levels.

Rate Training Manuals

There are two general types of Rate Training Manuals. Rate Training Manuals (such as this one) are prepared for most enlisted rates and ratings, giving information that is directly related to the professional qualifications for advancement. Subject matter manuals give information that applies to more than one rating.

Rate Training Manuals are revised from time to time to bring them up to date technically. The revision of a Rate Training Manual is identified by a letter following the NavPers number. You can tell whether a Rate Training Manual is the latest edition by checking the NavPers number (and the letter following the number) in the most recent edition of List of Training Manuals and Correspondence Courses, NavPers 10061 (Series). (NavPers 10061 is actually a catalog that lists current training manuals and correspondence courses; you will find this catalog useful in planning your study program.)

Rate Training Manuals are designed for the special purpose of helping naval personnel prepare for advancement. By this time, you have probably developed your own way of studying these manuals. Some of the personnel you train, however, may need guidance in the use of Rate Training Manuals. Although there is no single "best" way to study a training manual, the following suggestions have proved useful for many people:

1. Study the military requirements and the professional qualifications for your rate before you study the training manual, and refer to the "quals" frequently as you study. Remember, you are studying the training manual primarily to meet these "quals."

2. Set up a regular study plan. If possible, schedule your studying for a time of day when you will not have too many interruptions or distractions.

3. Before you begin to study any part of the training manual intensively, get acquainted with the entire manual. Read the preface and the table of contents. Check through the index. Thumb through the manual without any particular plan, looking at the illustrations and reading bits here and there as you see things that interest you.

4. Look at the training manual in more detail, to see how it is organized. Look at the table of contents again. Then, chapter by chapter, read the introduction, the headings, and the subheadings. This will give you a clear picture of the scope and content of the manual.

5. When you have a general idea of what is in the training manual and how it is organized, fill in the details by intensive study. In each study period, try to cover a complete unit—it may be a chapter, a section of a chapter, or a subsection. The amount of material you can cover at one time will vary. If you know the subject well, or if the material is easy, you can cover quite a lot at one time. Difficult or unfamiliar material will require more study time.

6. In studying each unit, write down questions as they occur to you. Many people find it helpful to make a written outline of the unit as they study, or at least to write down the most important ideas.

7. As you study, relate the information in the training manual to the knowledge you already have. When you read about a process, a skill, or a situation, ask yourself some questions. Does this information tie in with past experience? Or is this something new and different? How does this information relate to the qualifications for advancement?

8. When you have finished studying a unit, take time out to see what you have learned. Look back over your notes and questions. Maybe some of your questions have been answered, but perhaps you still have some that are not answered. Without referring to the training manual, write down the main ideas you have learned from studying this unit. Do not just quote the manual. If you cannot give these ideas

in your own words, the chances are that you have not really mastered the information.

9. Use Enlisted Correspondence Courses whenever you can. The correspondence courses are based on Rate Training Manuals or other appropriate texts. As mentioned before, completion of a mandatory Rate Training Manual can be accomplished by passing an Enlisted Correspondence Course based on the training manual. You will probably find it helpful to take other correspondence courses, as well as those based on mandatory training manuals. Taking a correspondence course helps you to master the information given in the training manual, and also gives you an idea of how much you have learned.

INCREASED RESPONSIBILITIES

When you assumed the duties of a PO3, you began to accept a certain amount of responsibility for the work of others. With each advancement, you accept an increasing responsibility in military matters and in matters relating to the professional work of your rate. When you advance to PO1 or CPO, you will find a noticeable increase in your responsibilities for leadership, supervision, training, working with others, and keeping up with new developments.

As your responsibilities increase, your ability to communicate clearly and effectively must also increase. The simplest and most direct means of communication is a common language. The basic requirement for effective communication is therefore a knowledge of your own language. Use correct language in speaking and in writing. Remember that the basic purpose of all communication is understanding. To lead, supervise, and train others, you must be able to speak and write in such a way that others can understand exactly what you mean.

Leadership and Supervision

As a PO1 or CPO, you will be regarded as a leader and supervisor. Both officers and enlisted personnel will expect you to translate the general orders given by officers into detailed, practical, on-the-job language that can be understood and followed by relatively inexperienced personnel. In dealing with your juniors, it is up to you to see that they perform their jobs correctly. At the same time, you must be able to explain to officers any important problems or needs of enlisted personnel. In all military and professional matters, your responsibilities will extend both upward and downward.

Along with your increased responsibilities, you will also have increased authority. Officers and petty officers have POSITIONAL authority—that is, their authority over others lies in their positions. If your CO is relieved, for example, he no longer has the degree of authority over you that he had while he was your CO, although he still retains the military authority that all seniors have over subordinates. As a PO1, you will have some degree of positional authority; as a CPO, you will have even more. When exercising your authority, remember that it is positional—it is the rate you have, rather than the person you are, that gives you this authority.

A Petty Officer conscientiously and proudly exercises his authority to carry out the responsibilities he is given. He takes a personal interest in the success of both sides of the chain of command ... authority and responsibility. For it is true that the Petty Officer who does not seek out and accept responsibility, loses his authority and then the responsibility he thinks he deserves. He must be sure, by his example and by his instruction, that the Petty Officers under him also accept responsibility. In short, he must be the leader his title—Petty Officer—says he is.

Training

As a PO1 or CPO, you will have regular and continuing responsibilities for training others. Even if you are lucky enough to have a group of subordinates who are all highly skilled and well trained, you will still find that training is necessary. For example, you will always be responsible for training lower rated personnel for advancement. Also, some of your best workers may be transferred; and inexperienced or poorly trained personnel may be assigned to you. A particular job may call for skills that none of your personnel have. These and similar problems require that you be a training specialist—one who can conduct formal and informal training programs to qualify personnel for advancement, and one who can train individuals and groups in the effective execution of assigned tasks.

In using this training manual, study the information from two points of view. First, what do you yourself need to learn from it? And second, how would you go about teaching this information to others?

Training goes on all the time. Every time a person does a particular piece of work, some learning is taking place. As a supervisor and as a training expert, one of your biggest jobs is to see that your personnel learn the RIGHT things about each job so that they will not form bad work habits. An error that is repeated a few times is well on its way to becoming a bad habit. You will have to learn the difference between oversupervising and not supervising enough. No one can do his best work with a supervisor constantly supervising. On the other hand, you cannot turn an entire job over to an inexperienced person and expect him to do it correctly without any help or supervision.

In training lower rated personnel, emphasize the importance of learning and using correct terminology. A command of the technical languages of your occupational field (rating) enables you to receive and convey information accurately and to exchange ideas with others. A person who does not understand the precise meaning of terms used in connection with the work of his rating is definitely at a disadvantage when he tries to read official publications relating to his work. He is also at a great disadvantage when he takes the examinations for advancement. To train others in the correct use of technical terms, you will need to be very careful in your own use of words. Use correct terminology and insist that personnel you are supervising use it too.

You will find the Record of Practical Factors, NavPers 1414/1, a useful guide in planning and carrying out training programs. From this record, you can tell which practical factors have been checked off and which ones have not yet been done. Use this information to plan a training program that will fit the needs of the personnel you are training.

On-the-job training is usually controlled through daily and weekly work assignments. When you are working on a tight schedule, you will generally want to assign each person to the part of the job that you know he can do best. In the long run, however, you will gain more by assigning personnel to a variety of jobs so that each person can acquire broad experience. By giving people a chance to do carefully supervised work in areas in which they are relatively inexperienced, you will increase the range of skills of each person and thus improve the flexibility of your working group.

Working With Others

As you advance to PO1 or CPO, you will find that many of your plans and decisions affect a large number of people, some of whom are not even in your own occupational field (rating). It becomes increasingly important, therefore, for you to understand the duties and the responsibilities of personnel in other ratings. Every petty officer in the Navy is a technical specialist in his own field. Learn as much as you can about the work of others, and plan your own work so that it will fit into the overall mission of the organization.

Keeping Up With New Developments

Practically everything in the Navy—policies, procedures, publications, equipment, systems—is subject to change and development. As a PO1 or CPO, you must keep yourself informed about changes and new developments that affect you or your work in any way.

Some changes will be called directly to your attention, but others will be harder to find. Try to develop a special kind of alertness for new information. When you hear about anything new in the Navy, find out whether there is any way in which it might affect the work of your rating. If so, find out more about it.

SOURCES OF INFORMATION

As a PO1 or CPO, you must have an extensive knowledge of the references to consult for accurate, authoritative, up-to-date information on all subjects related to the military and professional requirements for advancement.

Publications mentioned in this chapter are subject to change or revision from time to time—some at regular intervals, others as the need arises. When using any publication that is subject to revision, make sure that you have the latest edition. When using any publication that is kept current by means of changes, be sure you have a copy in which all official changes have been made.

The reading list at the beginning of this manual consists of USAFI courses that offer additional background material. The educational services officer will always have the most up-to-date information and training manuals applicable to your rating.

In addition to training manuals and publications, training films furnish a valuable source of supplementary information. Films that may be helpful are listed in the U.S. Navy Film Catalog, NavAir 10-1-777.

ADVANCEMENT OPPORTUNITIES FOR PETTY OFFICERS

Making chief is not the end of the line as far as advancement is concerned. Proficiency pay, advancement to Senior (E-8) and Master (E-9) Chief, and advancement to Warrant Officer and Commissioned Officer are among the opportunities that are available to qualified petty officers. These special paths of advancement are open to personnel who have demonstrated outstanding professional ability, the highest order of leadership and military responsibility, and unquestionable moral integrity.

PROFICIENCY PAY

The Career Compensation Act of 1949, as amended, provides for the award of proficiency pay to designated military specialities. Proficiency pay is given in addition to regular pay and allowances and any special or incentive pay to which you are entitled. Certain enlisted personnel in pay grades E-4 through E-9 are eligible for proficiency pay. Proficiency pay is awarded in two categories: (1) Speciality pay—to designated ratings and NEC's, and (2) Superior performance pay—for superior performance of duty in certain specialities not covered by speciality pay. The eligibility requirements for proficiency pay are subject to change. In general, however, you must be recommended by your commanding officer, have a certain length of time on continuous active duty, and be career designated.

ADVANCEMENT TO SENIOR AND MASTER CHIEF

Chief petty officers may qualify for the advanced grades of Senior and Master Chief which are now provided in the enlisted pay structure. These advanced grades provide for substantial increases in pay, together with increased responsibilities and additional prestige. The requirements for advancement to Senior and Master Chief are subject to change but, in general, include a certain length of time in grade, a certain length of time in the naval service, a recommendation by the commanding officer, and a sufficiently high mark on the Navy-wide examination. The final selection for Senior and Master Chief is made by a regularly convened selection board.

Examination Subjects

Qualifications for advancement to Senior Chief Petty Officer and Master Chief Petty Officer have been developed and published in the Manual of Qualifications for Advancement, NavPers 18068 (Series). They officially establish minimum military and professional qualifications for Senior and Master Chief Petty Officers.

Training Publications for Advancement, NavPers 10052 (Series) contains a list of study references which may be used to study for both military and professional requirements.

The satisfactory completion of the correspondence course titled Navy Regulations, NavPers 10740-A4, is mandatory for advancement to E-8, and the course titled Military Justice in the Navy, NavPers 10993-A, is required of all personnel advancing to E-9.

ADVANCEMENT TO WARRANT AND COMMISSIONED OFFICER

The Warrant Officer program provides opportunity for advancement to warrant rank for E-6 and above enlisted personnel. E-6's, to be eligible, must have passed an E-7 rating exam prior to selection.

The LDO program provides a path of advancement from warrant officer to commissioned officer. LDO's are limited, as are warrants, in their duty, to the broad technical fields associated with their former rating.

If interested in becoming a warrant or commissioned officer, ask your educational services officer for the latest requirements that apply to your particular case.

CHAPTER 2

AIRCRAFT HANDLING EQUIPMENT

There are many types of mobile and nonmobile equipment used by the ABH and each has a specific job. The ability to operate and maintain this equipment is the key to maximum performance. Tractors, spotting dollies, cranes, chocks, tow bars, and tie-downs are the tools of the plane director and handler. As with all tools, their safe and proper use is required to perform a creditable job. The ABH1 and ABHC must have a knowledge of their capabilities in order to supervise their use.

TOW TRACTORS

Most present day aircraft are too heavy and large to be moved by manpower alone. Therefore, the tow tractor is a means of propulsion for the majority of aircraft when the aircraft is on the ground and the engines are not running.

The characteristics of importance to the ABH are the tow tractor's maneuverability, weight, drawbar pull, engine and transmission type, and the type of aircraft support equipment that may be installed.

Maneuverability of the tractor depends on its dimensions and turning radius. The smaller the dimensions and turning radius the more maneuverable the tractor will be. The type of transmission may also contribute to the ease of handling of the tractor.

The drawbar pull is the amount of force that the tractor can exert. The drawbar pull of any tractor is dependent on the type and condition of surface on which it is being used. Dry concrete gives the most traction, hence the most drawbar pull for a given tractor. On a wet, fuel soaked steel or wooden flight deck, the tractive force may be almost nil.

Support equipment for supplying electric power and/or low compressed air for aircraft engine starting or servicing and electric power for brake operation may be installed on some tractors.

Tow tractors are usually classified by one of two designations--the M series and the TA series. Some tractors may have both designations. The first two letters of the M series do not have a standard meaning. The number in the M series is the model number. A letter following the model number indicates the number of modifications to that model tractor. An A indicates the first modification, etc. The TA in the TA series denotes Tractor, Aircraft. The numbers following the TA indicate the first two numbers of the drawbar pull, for example, the TA-75 has a drawbar pull of 7,500 pounds.

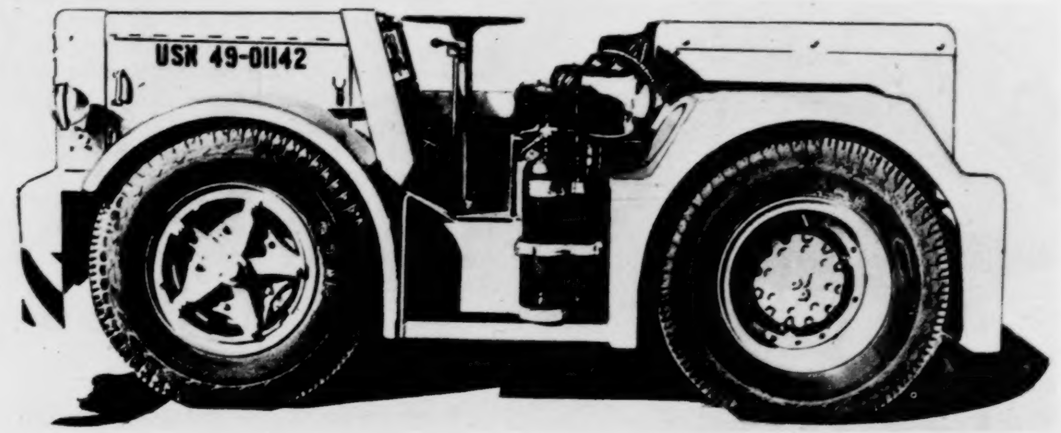
HOUGH MC-2

The MC-2 (fig. 2-1) is designed for use in towing and spotting aircraft on various types of surfaces. Towing hitches are provided on both front and rear of the tractor. This tractor is equipped with a full reversing, three-speed, power shift transmission. The transmission is controlled by two levers attached to the steering column (speed range lever and directional lever). Power for this tractor is supplied by a six-cylinder gasoline engine and a two-phase, single-stage torque converter.

The MC-2 is 11 feet 2 inches long, 8 feet wide, and 4 feet 4 inches high, with a ground clearance of 9 inches. The turning radius is 11 feet 8 inches and the weight is approximately 23,500 pounds. The MC-2 is capable of exerting a 15,000-pound drawbar pull.

HOUGH TA-18 GASOLINE

The TA-18 (fig. 2-2) is a gasoline-powered tractor with four-wheel drive, designed for towing and spotting large aircraft at relatively low speeds (less than 20 mph). Front and rear tow fittings are provided to facilitate positioning its load. Both steering and brakes are power assisted. Power for the tractor is provided by a V-8, high-torque, heavy duty gasoline engine, which is water cooled. The transmission is a fully automatic unit providing six forward speeds and a reverse speed. The maximum permissible road speed is 5 mph in LO-2, 10 mph in 3-4, 14 mph in 3-5, and 20 mph in 3-HI. All automatic shift points are controlled by a combination of engine speed, engine loading, and throttle



AB.576

Figure 2-1.—MC-2 Tow Tractor.

opening. Shifts can be made by the operator by manual setting of the transmission shift lever.

CAUTION: This should never be done in such a manner as to cause the tractor to exceed, in any gear range, the maximum speeds given above.

The tractor weighs 25,800 pounds and exerts a drawbar pull of 18,000 pounds. It is 14 feet 10 inches long, 8 feet wide, and 5 feet 7 inches high with a minimum ground clearance of 13 inches. The turning radius is 24 feet 10 inches. Some of these tractors are provided with weather protection for the driver, while others have an open driving position.

TA-75 GASOLINE

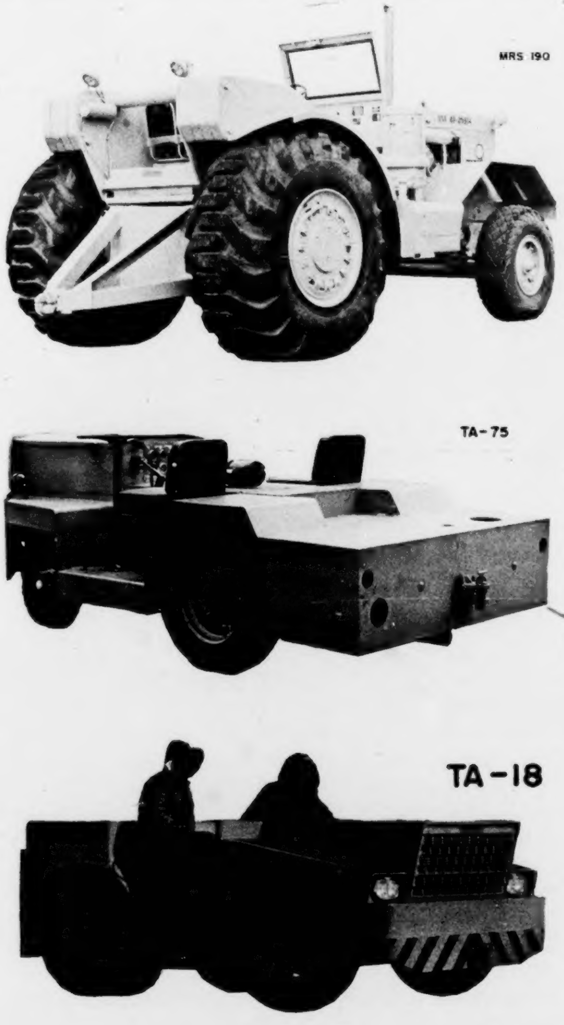
The TA-75 (fig. 2-2) is a gasoline powered tractor intended for use as an aircraft spotting vehicle for aircraft up to 75,000 pounds. The tractor has provisions for mounting a gas turbine compressor to be used in starting jet engines. It is equipped with a three-speed automatic transmission that is pushbutton operated from the dash panel. The dimensions are 10 feet long, 5 feet 6 inches wide, and 4 feet 6 inches high. The turning radius is 10 feet. The drawbar pull is 7,500 pounds and the weight is 10,500 pounds.

M-R-S 190 DIESEL

The M-R-S 190 (fig. 2-2) airfield arresting gear tow tractor is intended for use in positioning arresting gear chain on runways at air stations. It is also used as a tow tractor on some beaching ramps. It is powered by a six-cylinder, 335-horsepower full diesel engine, and is equipped with a selective type transmission providing five forward speeds and one reverse speed. Steering is by conventional steering gear with reduction and a hydraulic booster. It has two-wheel drive with two wheel air-over-hydraulic brakes. The equipment is complete with all controls, switches, and indicators necessary for normal operation. This tractor is a huge piece of equipment. It weighs approximately 47,300 pounds, is 17 feet 4 inches long, 9 feet 6 inches wide, with a ground clearance of 15 inches, and is capable of exerting sufficient drawbar pull to perform any work that may be required.

HOUGH MD-3/3A DIESEL

The MD-3 (fig. 2-3) is designed to tow aircraft on various types of surfaces in various kinds of inclement weather that may be experienced through an ambient temperature range of 25°F and 125°F. This tractor is a self-contained unit capable of developing 8,500 pounds of drawbar pull on dry, level concrete (nonskid) at an approximate speed of 1 mph.



AB.577

Figure 2-2.—Tow tractors.

A gas turbine compressor (GTCP-100) may be mounted at the rear of this tractor, supplying pneumatic power in the form of compressed air for the operation of large class pneumatic equipment, such as aircraft main engine starters, air conditioning systems, and other large consumers of compressed air.

The main powerplant for this tractor is an internal diesel combustion, four-stroke cycle, six-cylinder engine. The steering system is hydraulically assisted, and the service brakes are assisted by compressed air. The transmission is a multiple reduction drive unit (three speed ranges forward-one range reverse) that shifts automatically in all forward gears. The MD-3/3A presents a low silhouette for maneuverability in congested areas. The tractor weighs 12,000 pounds and is 13 feet 5 inches long, 5 feet 5 inches wide, and 3 feet high with a minimum ground clearance of 7 1/2 inches. The turning radius is 11 feet 0 inches.

OPERATION

Supervision of tow tractor operation is a major concern of the ABH1 and ABHC. Although he will not normally drive or operate the tractor, the ABH1 and ABHC must know the operating procedures and be able to carry on a training program for lower rated personnel.

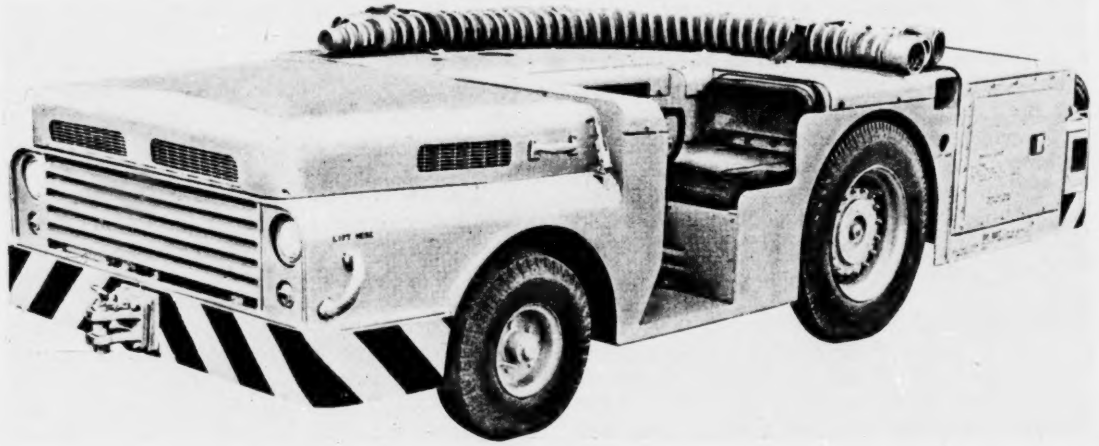
Drivers who perform towing operations must be fully qualified. In other words, no attempt should be made to train a new driver during actual towing operations. Driver training is an operation of its own and must be carried on in an area where traffic can be controlled and the aircraft being towed is not likely to strike anything.

Tractors should not be used to push or pull any equipment other than that specified by local directives. As a general rule, a tractor can safely tow an aircraft weighing ten times its drawbar pull over dry, level concrete. Of course, weather conditions and terrain can affect the weight that the tractor can safely tow.

Tractors with four-wheel drive have a turning radius twice that of rear-wheel drive tractors and are more difficult to turn and maneuver.

Tractors equipped with air brakes must not be moved until the air tank reaches its full rated operating pressure. This requires a minute or so after starting the engine. A red light on the panel lights up anytime the air pressure is low.

The proper approach to an aircraft must be that of sound judgment on the part of the driver and/or plane director. A tractor should never be permitted to pass under any part of an aircraft unless it is absolutely essential to the towing operation. When this is necessary, personnel must be stationed so that all clearances between the tractor and aircraft can be observed.



AB.255

Figure 2-3.—MD-3/3A Aircraft Tow Tractor.

Someone other than the tractor driver should be present to hook the tractor to the tow bar. If the driver must do this, the tractor engine must be stopped and the parking brake set before getting off the tractor.

NOTE: Aboard ship, whenever a tractor is not manned, it must be chocked in addition to setting the parking brake, regardless of the time period it is to be unmanned.

After hookup of the tow bar is made, no attempt should be made to move an aircraft until a fully qualified man is in the cockpit of the aircraft—one who fully understands the operation to be performed.

Extreme care must be taken when backing a towed aircraft to avoid jackknifing the tractor into the tow bar.

Towing speed should be limited to 5 miles per hour at all times.

More detailed information on towing operations is contained in ABH 3 & 2, chapter 4.

MAINTENANCE

Due to the weight of modern aircraft in the Navy today, aircraft tow tractors are one of the ABH's most important items of equipment. It is virtually impossible to physically move an aircraft without them, let alone to do it safely and/or to respot to meet the requirements of the flight schedule. Therefore, it is necessary for tow tractors to be kept in the best condition possible.

In order to keep tractors and/or enclosures ready for service it is a must that an inspection and preventive maintenance program be set up. Preventive maintenance is also a factor in accident prevention. In equipment the failure of a single part may cause the loss of the entire assembly. Loss of that equipment may cause the loss of personnel, and may be the difference between success or failure of an important mission. It has been determined that good preventive maintenance will keep a piece of equipment in safe and working order for a long time. An enforced preventive maintenance program is the key to a successful operation.

The maintenance and/or repair of tow tractors, as well as all ground support equipment, is performed by the Aircraft Intermediate Maintenance Department (AIMD), or the activity having permanent custody of the equipment. However, in order to properly carry out his duties as a tractor driver and/or supervisor of aircraft towing operations the ABH must have some knowledge of the mechanical difficulties that may be encountered in their operation. Some of these difficulties have been discussed in preceding paragraphs.

It is the responsibility of the tractor driver to complete the daily and preoperational inspections as described in the applicable Maintenance Requirements Cards (MRC's).

It is the responsibility of the supervisor to insure that these inspections and servicing of the tow tractor are carried out in an approved manner. A tractor should never be used in a towing operation until the daily and preoperational inspections have been made in accordance with the Maintenance Requirements Cards and any noted discrepancies corrected. Minor difficulties should be noted and corrected to avoid the development of major repairs and unnecessary "down" time.

SAFETY PRECAUTIONS

The importance of safety cannot be overstressed. The safety factor is one of the first considerations of any job. After an accident has happened, investigation almost invariably shows that it could have been prevented by the exercising of simple safety precautions which are then posted for future guidance, but which never undo the consequences of the accident that has gone before. Safety precautions must always be observed.

One of the major causes of accidents is the lack of attention to the job being done. The safety precautions necessary for the safe operation of each piece of equipment should be studied and discussed at length with personnel concerned before any operation is attempted.

The safety precautions are issued by individual commanding officers to suit particular needs of activities, ships, and operating schedules. All personnel concerned with tow tractor operation should be familiar with these instructions.

Only qualified drivers should be allowed to operate a tow tractor. A qualified driver is one that has satisfactorily completed a training program in the operation of towing equipment, has read and understands the operations section of the technical manual for the tractor he is to operate, and knows and understands the standard signals used in the directing of aircraft towing.

The following precautions are to be observed while aircraft are being towed.

1. Look in the intended direction of travel to be sure no personnel or obstructions are in the way. Sufficient clearances must exist on all sides of the tractor and load while both are moving as a unit.
2. Move slowly on wet or slippery surfaces and in congested areas.
3. Pull the load gradually and tow it at a steady rate, keeping in mind the type of surface being traveled. Tow in a gear range and at a speed that minimizes sudden speed changes; i.e., operate in a speed range that will allow full acceleration of the engine, and allow ample turning space.

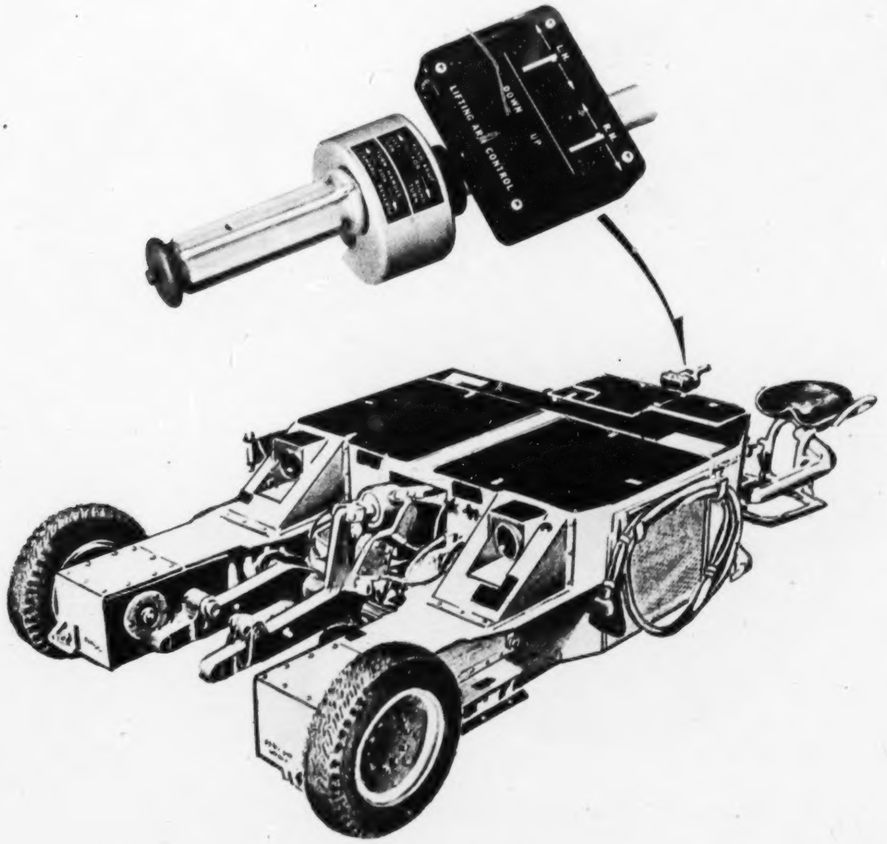
The tow tractor should be used only for those jobs for which it was designed or has been authorized. It is not a "wrecker" and should not be used to push-start other tractors or vehicles. Passengers should be carried only on those tractors that have seats installed for this purpose. Tractors should not be used as a truck to haul parts or other equipment.

The MAXIMUM speed limit for a tractor towing an aircraft is 5 mph. The tractor must be operated so as to avoid any sudden stops or starts. Extreme care must be taken when towing an aircraft over rough ground and/or arresting gear pendants. Jerking, bumping, and bouncing can quickly disconnect the tow bar from the aircraft or tractor.

When operating a tractor on which a gas turbine compressor is installed, additional safety precautions must be observed. The starting and operating procedures for the turbine are given on a plate fixed to the tractor instrument panel and must be followed. Before starting the unit, make sure that the area around the compressor inlet and exhaust outlet is clear of all loose gear. All personnel must stand clear of the compressor air inlet, the exhaust outlet, and the area adjacent to the plane of rotation of the high-speed compressor and turbine assembly. Personnel handling the flexible air ducts should wear asbestos gloves when connecting and disconnecting the duct to the aircraft, and stand well clear of the duct quick disconnect fittings during starting operations.

NOTE: Extreme care must be exercised in the approach and final spot when using a tractor equipped with a high-speed compressor and turbine assembly to insure that the extremely high temperature of the exhaust is not directed against aircraft, ordnance, fueling hoses, or personnel, etc.

The ABH1 and ABHC supervising the use of tow tractors must, as a part of their responsibilities, insist that only proper operating and maintenance procedures be followed and that all safety precautions be observed.



A.B.578

Figure 2-4.—Aircraft spotting dolly SD-1C.

AIRCRAFT SPOTTING DOLLY MODEL SD-1C

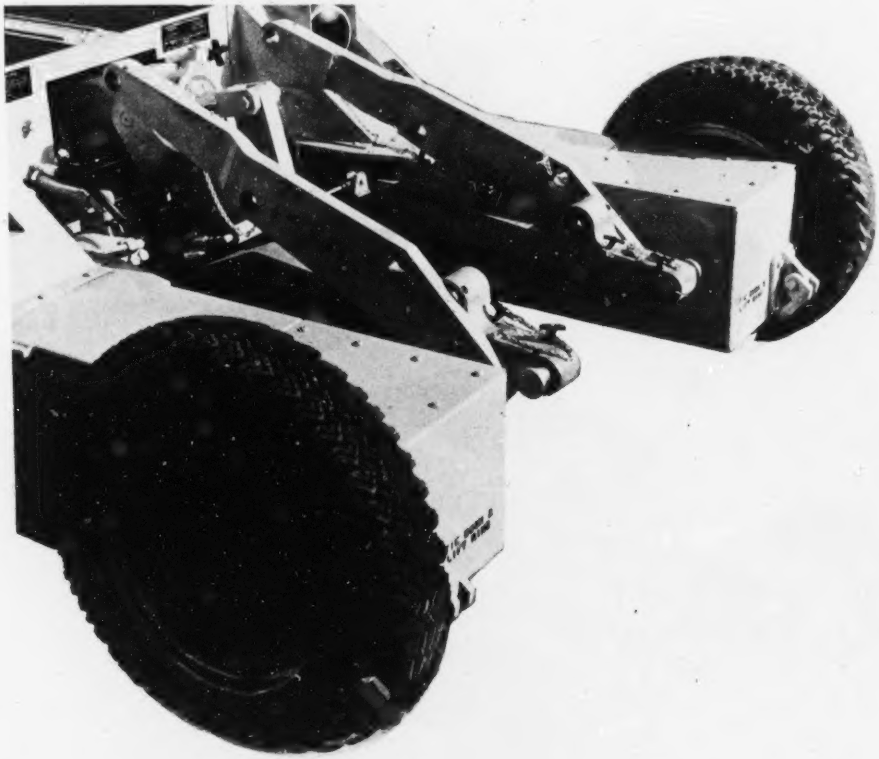
The SD-1C aircraft spotting dolly (fig. 2-4) is a self-contained diesel engine driven unit intended for use in towing, turning, and spotting carrier type aircraft, providing maximum maneuverability in congested areas with only one-man operation.

The spotting dolly is a three-wheeled unit, two of the wheels being driven and the third, a free-wheeling caster. A diesel prime mover drives two variable displacement pumps which supply varying amounts of power to hydraulic motors which drive the wheels. A third pump maintains a positive head on the hydraulic systems and supplies control pressures.

The lifting arms (fig. 2-5) are hydraulically controlled by a main hydraulic cylinder and two secondary hydraulic cylinders. The arms house different size axle pins for engagement with the nosewheel of specific types of aircraft.

The SD-1C spotting dolly has a drawbar pull rating of 6,000 pounds and a nosewheel lifting capacity of 16,000 pounds for maneuvering aircraft on its own landing gear to any desired position. This dolly is equipped with a 28-volt, 40-ampere, d-c output to supply aircraft needs during spotting operations.

Control of the dolly is accomplished through a single handle on the end of the control arm. (See fig. 2-4.) Steering is accomplished by pushing the handle left or right; speed and direction (forward or reverse) by twisting the handle.



AB.579

Figure 2-5.—Aircraft nosewheel lifting assembly.

The operator may walk with the unit, or ride on the operator's seat, controlling it with a single hand.

CAUTION: Maximum speed is 5 miles per hour loaded and 10 miles per hour unloaded.

The dolly is 11 feet 7 inches long, 6 feet 3 inches wide, and 29 inches high, with a gross weight of 5,500 pounds. Self-propelled, the spotting dolly moves an aircraft by picking up its nosewheel and moving it in any direction with no turning radius required by the spotting dolly.

When using the spotting dolly to move an aircraft the usual manner is to set the brakes on the main landing gear, lower the lifting arms, drive the dolly under the nosewheel, insert two axle pins in the lifting arms, raise the lifting arms, release the aircraft's brakes, and drive away.

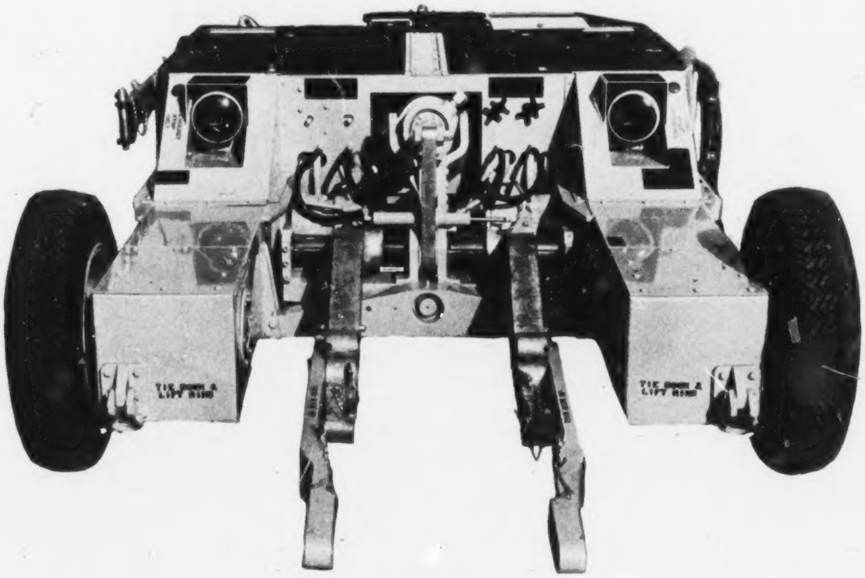
The dolly is also equipped with removable fork lift tines that can be used for lifting pallets with weights up to 2,000 pounds.

AIRCRAFT CRANES

Cranes are installed on carriers, cruisers, and auxiliaries for handling airplanes, boats, missiles, bombs, torpedoes, mines, trucks, paravanes, and stores. The number of cranes per ship vary, depending upon the specific requirements of the ship involved.

Cranes are designed to meet the following conditions:

1. Hoist, lower top, and rotate rated load at the specified speed, and against a specified list of the ship.
2. Handle 150 percent rated load at no specified speed.



AB.580

Figure 2-5.—Aircraft nosewheel lifting assembly—Continued.

3. Withstand a static, suspended load of 200 percent rated load without damage or distortion to any part of the crane or structure.

The types of cranes installed on the ship vary according to the equipment handled, and are classified in general type and type of drive as follows:

1. General type:
   a. Rotating king post. (See fig. 2-6.)
   b. Stationary king post.
   c. Fixed topping lift.
   d. Variable topping lift.
   e. Jib.
2. Type of drive:
   a. Electric-hydraulic.
   b. Straight electric.
   c. Gasoline engine.
   d. Diesel engine.
   e. Hand-operated.

DESCRIPTION

The crane equipment, in general, includes the boom, king post, king post bearings, sheaves, hook and rope, machinery platforms, rotating gear, drums, hoisting, topping and rotating drives, and control.

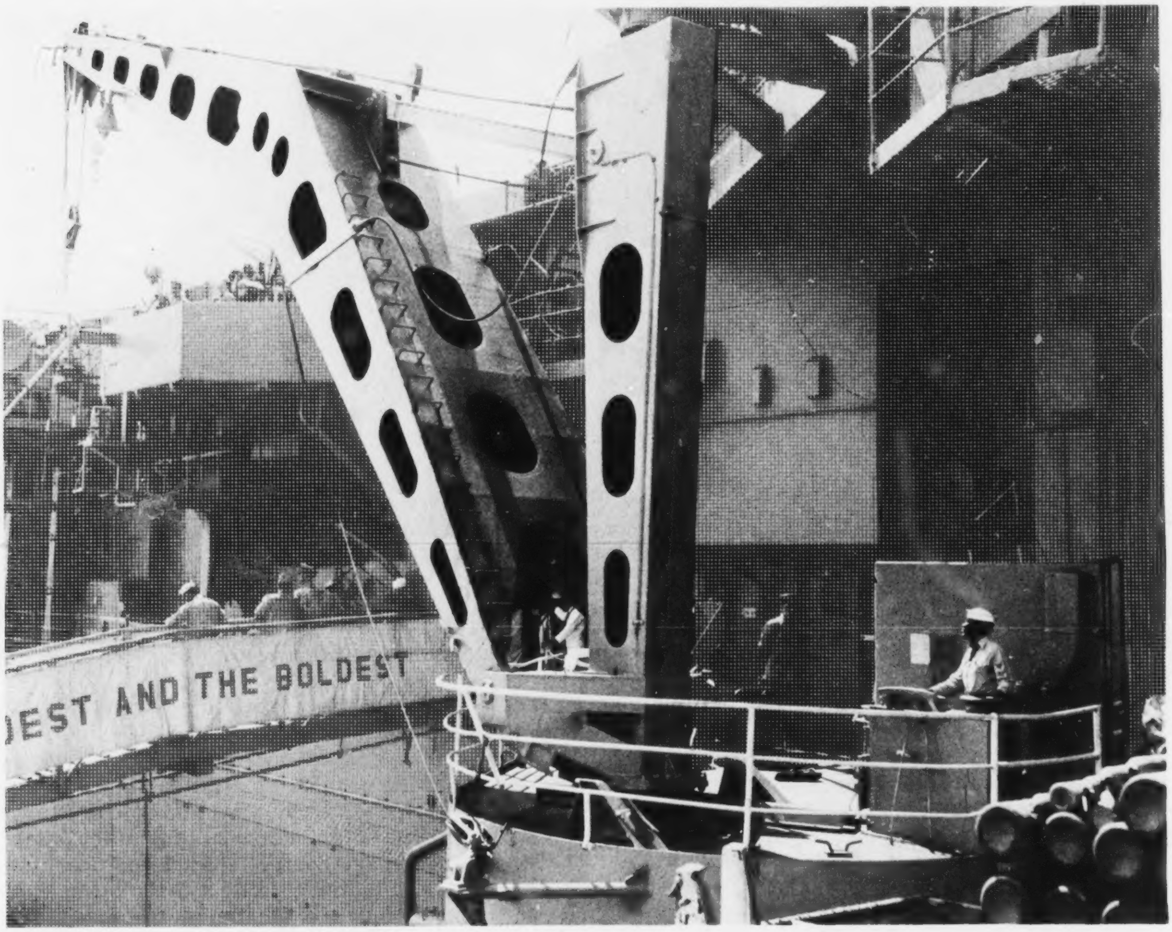
Electric-hydraulic cranes are installed where wide range of speed, delicate control, and smooth acceleration and deceleration are required, as in the case of airplane handling.

Electric-hydraulic equipment for the cranes consists of one or more electric motors, running at constant speed, each of which drives one or more variable displacement hydraulic pumps whose strokes are controlled through operating handwheels. "Start," "stop," and "emergency run" pushbuttons are located at the operator's station adjacent to the operating handwheels for the control of the electric motors. Interlocks are provided to prevent starting the electric motors when the hydraulic pumps are on stroke.

The fixed crane on most carriers is of the rotating king post type with electrohydraulic drive.

The description and capabilities of the crane given here are for the aircraft carriers, CVA-59, 60, and 61. The machinery for this crane consists of an electrohydraulic aircraft hoisting unit, cargo hoisting unit, and rotating unit. Each unit has a single speed, nonreversing, electric motor driving a hydraulic variable displacement pump which in turn drives its connected hydraulic fixed displacement motor and gear reducer.

The gear reducer for the aircraft hoisting unit drives a single grooved spooling drum.



AB.266

Figure 2-6.—Shipboard aircraft crane.

The aircraft hoisting unit is capable of the following operation:

1. A pull of 14,500 pounds at the drum gives the 1 1/8-inch diameter wire rope a travel of 80 feet per minute when handling a useful hook load of 50,000 pounds traveling at 20 feet per minute with a four-part purchase arrangement.

2. A pull of 900 pounds at the drum causes the wire rope to travel at 240 feet per minute when handling an empty hook traveling at 60 feet per minute with a four-part purchase arrangement.

The gear reducer for the cargo hoisting unit drives a single grooved spooling drum. The cargo hoisting unit is capable of the following operation:

1. A pull of 6,180 pounds at the drum gives the 3/4-inch diameter wire rope a travel of 120 feet per minute when handling a useful hook load of 10,000 pounds traveling at 60 feet per minute with a two-part purchase arrangement.

2. A pull of 295 pounds at the drum gives the wire rope a travel of 360 feet per minute when handling an empty hook traveling at 180 feet per minute with a two-part purchase arrangement.

3. A pull of 6,220 pounds at the drum gives the wire rope a travel of 120 feet per minute when handling a useful hook load of 5,000 pounds

traveling at 120 feet per minute with a single part purchase arrangement.

4. A pull of 565 pounds at the drum gives the wire rope a travel of 360 feet per minute when handling an empty hook traveling at 360 feet per minute with a single part purchase arrangement.

The gear reducer for the rotating unit drives a pinion gear meshing with the main rotating gear. The rotating unit is capable of rotating the crane at a maximum rate of 1/2 rpm with a hook load of 50,000 pounds and the ship listing adversely 5 degrees.

The operator's controls for the aircraft, cargo, and rotating units are grouped on one control stand and are all operated from the operating platform of the crane. A more detailed discussion of electrichydraulic cranes may be found in NavShips Technical Manual. The ABH1 and ABHC are responsible for knowing the limitations and capabilities of the cranes in their charge.

In order to operate a crane safely and efficiently, a crane operator must be assisted by one or more crane signalmen. These signalmen must be located at appropriate vantage points which offer an unobstructed view to the operator. Since the operator and signalmen must function smoothly as a team, a practical means of visual communication is necessary. (See fig. 2-7.)

CAUTION: Cranes are to be operated only by authorized personnel who are thoroughly trained in the fundamental rules of crane safety.

MOBILE CRANES

The ABH is concerned with the operation of both fixed and mobile cranes in the handling of aircraft. A fixed crane is one whose base is stationary although its boom is movable. The mobile crane has a wheeled chassis.

The mobile crane is an emergency vehicle primarily designed for use in aircraft salvage and rescue and is used both at shore stations and aboard ship.

The ABH responsible for directing the use of mobile cranes must have some knowledge of their operation and handling characteristics. Of vital importance is a knowledge of their lifting capacities and the boom positions at which these capacities are obtained.

Maximum performance of the mobile crane, including its operating equipment, is dependent upon the frequency and scope of the maintenance and preoperational checks rendered, plus the ability of the operator to properly operate the crane.

If any type of equipment deserves to be checked out top to bottom and given a thorough physical before using, it is the crane. If you are operating with defective equipment you not only run the risk of dropping the aircraft; you also run the risk of dropping it on another expensive aircraft or on personnel. Check out the crane and equipment before it is used.

Even if you have been around this equipment for a while, and certainly if you are new to the equipment, there are few general characteristics which deserve to be emphasized and which would be wise for you to keep in mind when working with and around mobile cranes. Personnel to whom the crane is assigned should become thoroughly familiar with the crane's technical manual prior to actual operation of the crane.

C-25 Mobile Crane

The C-25 Mobile Crane (fig. 2-8) is a truck-mounted crane manufactured by the Oshkosh Truck Co. It has a lifting capacity of 20 tons, has six-wheel drive, and a top speed of 50 mph.

NS-50/60 Mobile Cranes

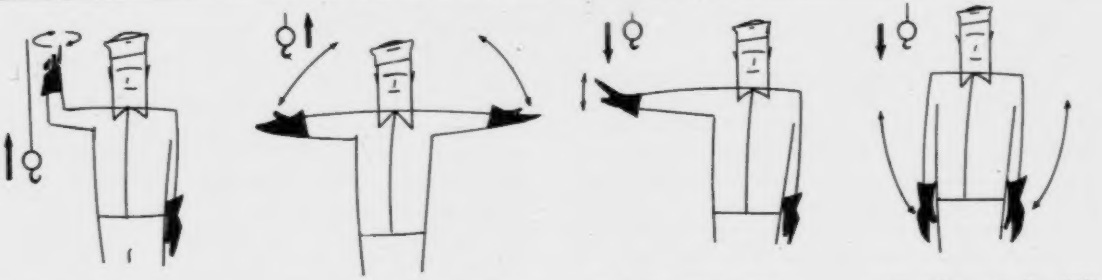
The NS-50/60 Mobile Crane is designed primarily to lift and carry crashed aircraft on the flight deck of an aircraft carrier, and is equally suitable for similar duty on shore stations for both aircraft landing areas or unpaved operational areas. See figure 2-9 for an illustration of the NS-50 Mobile Crane.

The NS-50 and NS-60 are quite similar in appearance mechanically and in operation, the basic difference being in the greater length of the boom and lifting capacity of the NS-60. For purpose of discussion, the NS-50 is described in this manual.

The NS-50 crane is a self-propelled vehicle, mounted on four electrically powered wheels.

Heavy-duty d-c electric traction motors and gear reduction units built within the wheel rims provide motive power for the crane. Each wheel motor is equipped with multiple-disc type spring-loaded brakes for emergency stops and parking, while a regenerative electrical braking system is used for operational deceleration of the crane.

Gear motors power the boom, hook, and steering. A-c electric motors strategically

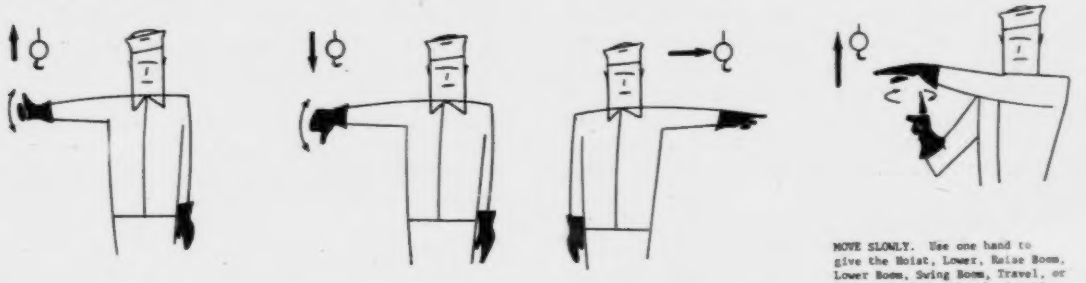


HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle clockwise.

HOIST. Hold both arms horizontal at sides, fully extended, and move upward and return.

LOWER. Arm extended, palm down, wave hand down and up.

LOWER. Hold arms at sides, fully extended and move out and return.

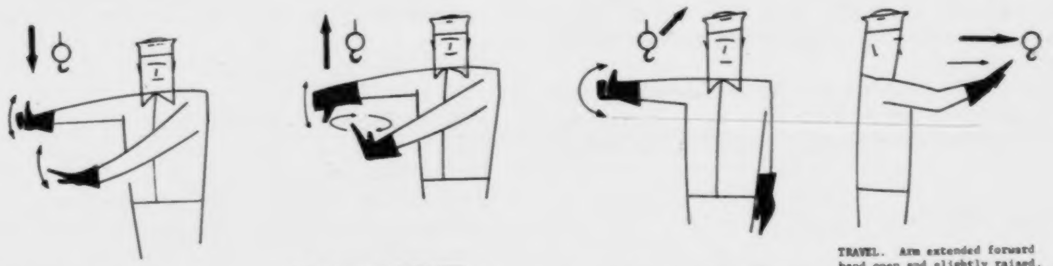


RAISE BOOM. Arm extended, fingers closed, thumb pointing upward, move hand up and down.

LOWER BOOM. Arm extended, fingers closed, thumb pointing down, move hand up and down.

SWING BOOM. Arm extended, point with finger in direction of motion.

MOVE SLOWLY. Use one hand to give the Hoist, Lower, Raise Boom, Lower Boom, Swing Boom, Travel, or Rack, and place other hand motionless near the hand giving the motion signal. (Hoist Slowly shown as example.)

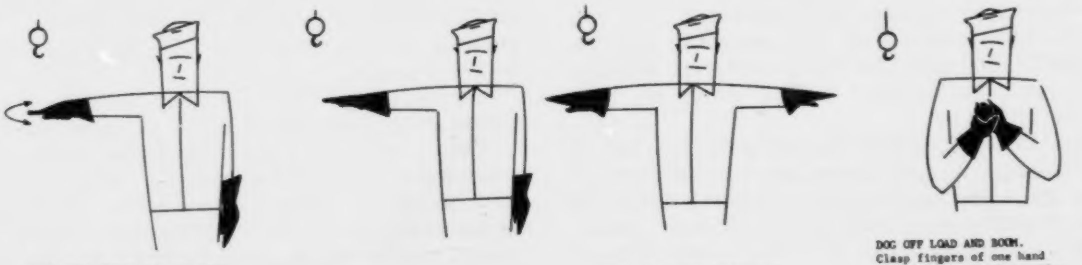


RAISE BOOM AND LOWER LOAD. Give Raise Boom signal with one hand and Lower Load signal with other hand.

LOWER BOOM AND RAISE LOAD. Give Lower Boom signal with one hand and Raise Load signal with other hand.

RACK. Palm up, fingers closed, thumb pointing in direction of motion, jerk hand horizontally.

TRAVEL. Arm extended forward hand open and slightly raised, wave forearm in direction of travel, while facing in that direction.



EMERGENCY STOP. Arm extended, palm down, move hand rapidly right and left.

STOP. Arm extended, palm down, hold position rigidly.

STOP. Hold arms horizontal at sides fully extended.

DOG OFF LOAD AND BOOM. Clasp fingers of one hand with fingers of other, palms facing each other.

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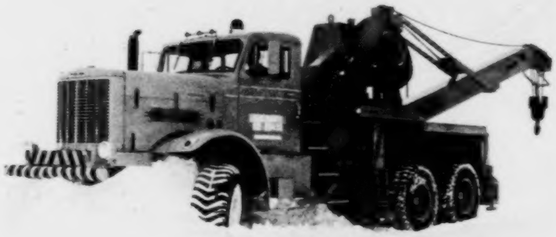
Figure 2-7.—Standard hand signals for crane operators and signalmen.



AB.582
Figure 2-8.—C-25 Oshkosh Mobile Crane.

located at the point of power application drive through gearboxes to power each crane function. Each a-c motor is equipped with a multiple-disc spring-loaded brake that sets instantly when the motor's electrical power is interrupted. Restoration of the motor's electrical power automatically releases the motor brake.

A-c and d-c generators, directly coupled to the diesel engine, supply current to the control motors and to the d-c drive motors. Fingertip switches on the operator's panel control the application of power to the a-c motors. One control handle on the panel provides power and directional control of the electric wheels, while another gives the operator complete wheel motor breaking control.

All normal operations required for maneuverability of the crane are managed from the operator's station. A remote control panel on the rear of the crane permits control of the hook and boom at a point near the load. The crane is 35 feet long overall without the boom. With the boom extended 23 feet, the overall length is 58 feet; and with the boom resting on the deck, the overall length is 71 feet. Overall height, with the boom extended 23 feet, is 31 feet 9 inches. With the boom resting on the deck the overall height is 17 feet. The width is 12 feet 4 inches. The turn radius is 30 feet. The crane is counterbalanced when lifting near-capacity loads by using counterweights. The crane should be operated with counterweight No. 1 in place during all hoisting operations.

The weight of this crane can be varied by the use of counterweights. There are four counterweights that can be installed singularly or in combination to vary the weight of the crane from 63,600 (no counterweights attached) to 83,750 pounds (all counterweights attached).

For load limits the weight of this crane varies with the position of the boom and the amount of counterweight that is attached. For the lifting capacities, see figure 2-9.

Cable Reeving (NS-50)

The lifting capacity and speed of hook travel can also be changed by changing the hook line reeving. The different reevings are as follows:

1. Three-part line reeving gives 25 fpm hook travel and a maximum of 50,000 pounds of lift.
2. Two-part line reeving gives 50 fpm hook travel and a maximum of 33,000 pounds of lift.
3. One-part line reeving gives 75 fpm hook travel and a maximum of 16,000 pounds of lift, using the swivel hook and block assembly.
4. One-part line reeving gives 75 fpm hook travel and a maximum of 15,500 pounds of lift, using the light capacity hook.

The hook line may be reeved in four manners. (See fig. 2-9.)

The first method of reeving employs the 7 1/2-ton hook reeved with a single part line; over the boom sheave, through the limit switch, dead ending and secured with the locking pin to the hook. The second method employs the 50,000-pound hook and a single part line. It is reeved over the boom sheave, through the limit switch, dead ending and secured with the hook locking pin. The third method is a two-part line; reeved over the boom sheave, through the limit switch, around the hook sheave, dead ending on the boom structure, swinging dead end, secured to the dead end with locking pin. The fourth method is a three-part line; reeved over the boom sheave, around the hook sheave, over the second boom sheave, dead ending on the hook block and secured with locking pin. Boom luffing lines are reeved as a four-part line to the dead end of the main frame.

CAUTION: Reeve boom and book lines to maintain not less than three wraps on their cable drums and at least two wraps around the boom dead ends on the yoke structure.

Each method of reeving allows the operator to employ the crane's hook at different capacities and hook speeds. Keep in mind that each crane has a maximum lift and reach rating. It is the responsibility of the supervisor/operator of the crane to make sure that the load does not exceed the crane's limits.

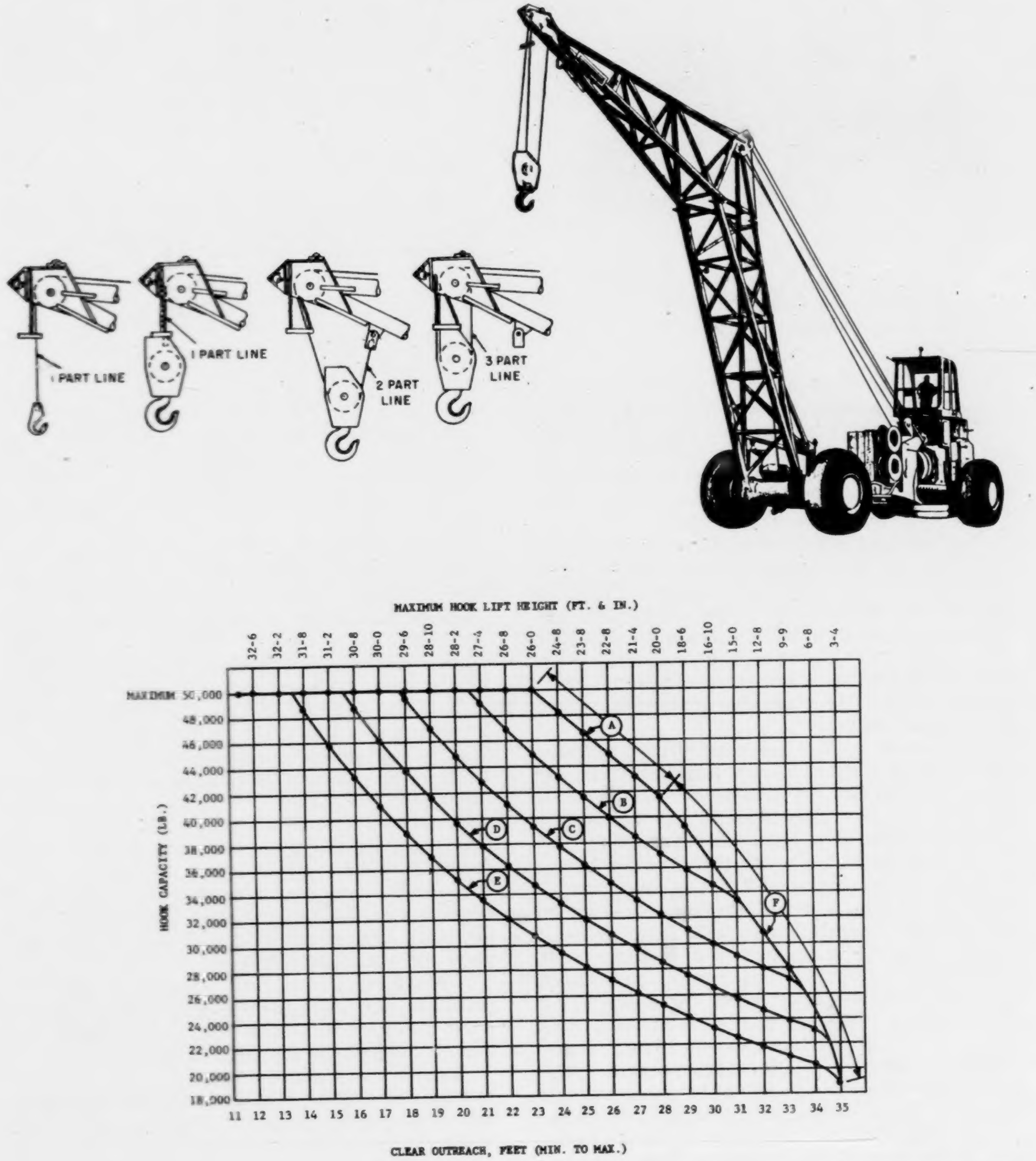


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Figure 2-9.—NS-50 Mobile Crane.

Operation

Only qualified operators are to be used to operate cranes. The operator must understand the function and operation of each of the crane's instruments and controls. This knowledge is essential for the proper maintenance and operation of the machine. This information can best be gained by a study of the operation manual.

Most cranes have warning lights on the instrument panel to indicate an abnormal condition of the machine. Warning lights are used to indicate low air pressure in the brake system, low engine oil pressure, and overtemperature of cooling systems and wheel drive motors. On some machines the light comes on when the component is operating normally, on others only when the component is malfunctioning.

Warning lights for the NS-50 are as follows:

1. Engine coolant—red—comes on when the coolant reaches 200°F.
2. Engine oil pressure—red—comes on when the oil pressure drops below 8 psi.
3. Drive wheel motors—amber—comes on when the drive wheel temperature reaches 290°F. When this light comes on, the snorkels that are used as an aid in cooling the wheel motor should be opened.
4. Drive wheel motors—red—comes on when the drive wheel motor reaches 340°F. The crane must be stopped when this light comes on.
5. The crane must be stopped when any red warning light comes on and the malfunction must be corrected before any further operation.

When the crane is being maneuvered to pick up a crashed aircraft, watch the position of the crane wheels in relation to the aircraft. Most cranes must be fairly close to the aircraft if the hook is to be in the proper position. Personnel must be stationed so that they can give ample warning if any part of the crane looks as if it would hit the aircraft. For the lifting of certain aircraft there are only one or two positions where the crane can be, if the hook is to be properly positioned.

Make sure that the hook is properly centered over the load to be lifted. Use small trial lifts in the beginning and be prepared to stop if the load tends to shift or swing.

When the crane is required to travel with a load, keep the load as close to the crane wheels and as close to the ground as possible. All stops, starts, and turns must be made very slowly to avoid swinging the load. When moving the crane with no load, the hook must be run up as close to the top as possible, or the hook must be lashed to the boom to keep it from swinging.

Safety Precautions

As with all heavy equipment, precautions should be taken when operating or servicing cranes. Your safety as well as the safety of a fellow worker depends on it.

It is imperative that the operator understands the function and operation of each of the instruments and control switches on the instrument panel. This knowledge is essential for the proper maintenance and safe operation of the mobile crane.

Personnel assigned as operators of the crane must be fully qualified in the operation of the crane and be familiar with the local instructions regarding the crane's use.

Never leave the crane with the engine operating and make sure that all electrical switches are turned off when leaving the crane.

Keep the speed of the crane to a minimum. Make all starts and stops as smoothly as possible.

Check instruments frequently during crane operations. Any abnormal gage indication should be checked immediately and corrected before continuing the operation. The crane must be stopped as quickly as possible when any warning light comes on and the trouble corrected.

Cables should be kept tight, but not under severe strain when the crane is not in operation. Inspect all cables periodically for frayed or broken strands and replace when necessary. Always wear gloves when making this inspection to prevent injury to the hands.

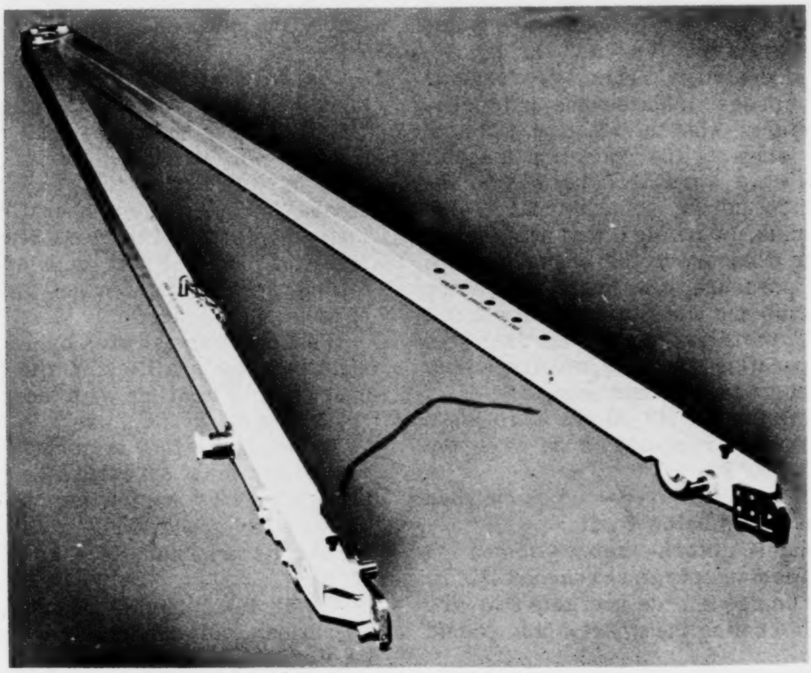
When operating a crane from the remote control station an operator must always be in the operator's cab.

Do not touch bare electrical connections or electrical cables if insulation is broken. Request the services of the maintenance electrician for performing all electrical checks and repairs.

TOW BARS

There are two classes of tow bars, those designated as universal and those designated as special. The special tow bars are those designed for use with only one type of aircraft. The universal tow bar, NT-4, is designed to tow and position all carrier based aircraft.

The Universal Aircraft Tow Bar, Model NT-4 (fig. 2-10), is the type tow bar most



AB.263

Figure 2-10.—NT-4 Universal Aircraft Tow Bar.

commonly used by the Navy today. It is designed to provide for the nose tow of aircraft, employing four different sizes of nosewheel axle tow holes. The NT-4 is also designed for towing aircraft provided with fuselage and landing gear tow rings. Attachment is dependent on the aircraft being towed and is accomplished by either axle pins or by hooks.

This tow bar is provided with a securing chain that will allow the tow bar to spread 25 inches thereby accommodating the maximum nosewheel axle length for carrier type aircraft. By detaching the chain from one side of the split tow bar, the tow bar may be opened as required for fuselage tow.

The tow bar is made of aluminum alloy, is 15 feet long, weighs 135 pounds, and is designed to handle aircraft with a maximum gross weight up to 90,000 pounds.

Most carrier aircraft have provisions for towing from the nosewheel axle. In view of the fact that the aircraft to be towed have been provided with four different sizes of holes, ranging from 3/4-inch diameter to 2 1/2-inch diameter, the tow pins have been sized to suit.

Before attaching the tow bar to the aircraft nosewheel, the proper size pin must be selected.

The axle pins are held in the tow bar by quick-release pins. After selecting the proper size, engage the pins in the towing holes of the aircraft. With the chain through the movable rail, engage the chain in the slot and tighten the chain by turning the knob (handtight) on the fixed rail.

CAUTION: Be sure that the chain is tight and under tension.

For aircraft that have towing rings on the fuselage or on the landing gear, hooks are provided on the tow bar. When engaging the hooks in the towing rings, make sure that the spring-loaded pin is completely closed. When using the hooks, the axle pins should never protrude on the inboard side of the tow bar and the chain should be stowed on the fixed rail. The axle pins can be stowed in the tow bar by installing them with the small tapered end flush with the

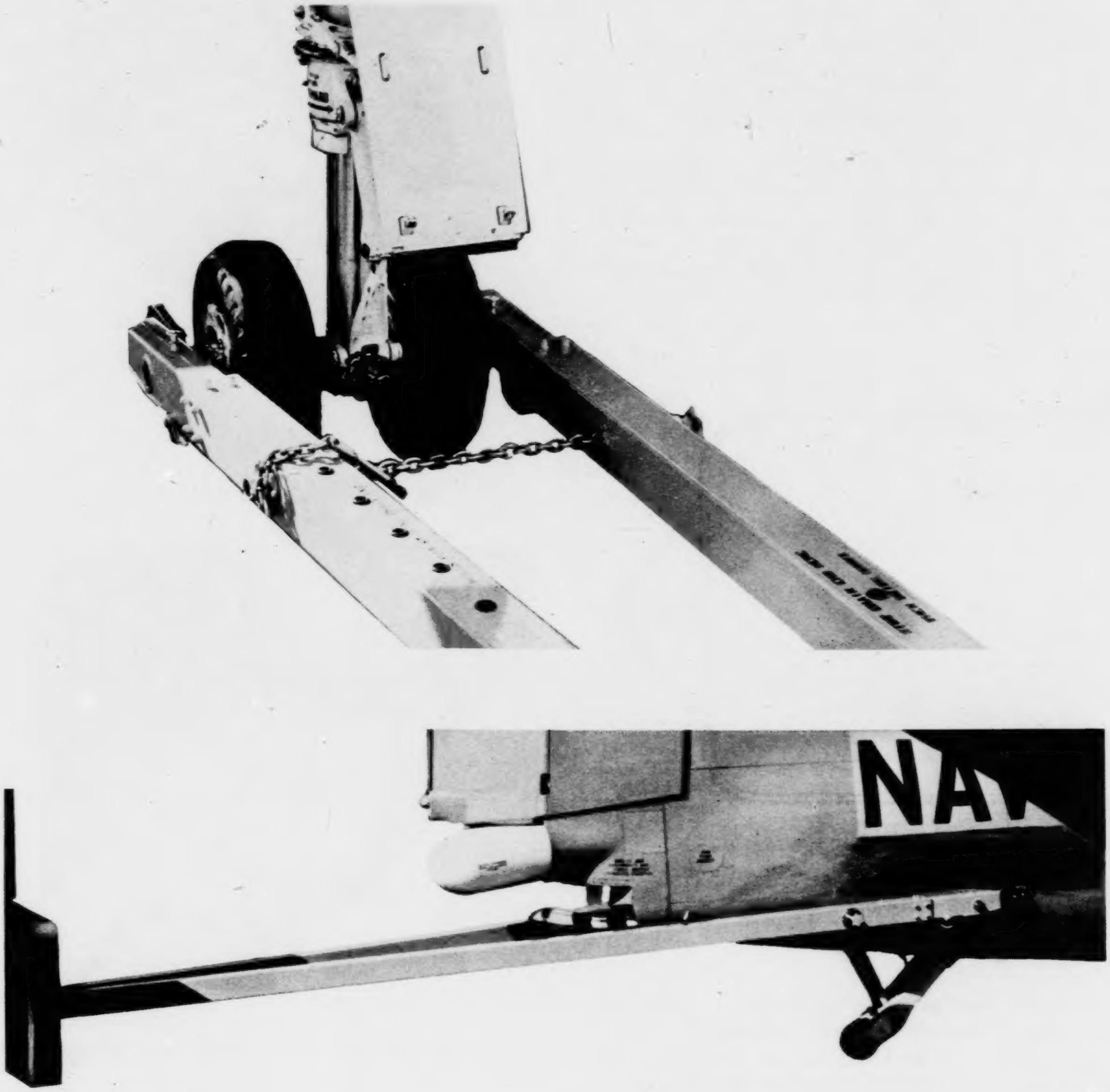


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Figure 2-11.—NT-4 attached to an S-2F for nosewheel or fuselage towing.

inboard side of the A-3 lug. Figure 2-11 shows an NT-4 attached to a S-2F aircraft.

When towing the tow bar without attachment to an aircraft, the axle pins should be installed with the small tapered end flush with the inboard side of the A-3 lugs and the chain engaged in the slot and stowed.

Special tow bars are those designed by the aircraft manufacturer for a special purpose, or to tow an aircraft that has special handling characteristics. An example of this type bar is the one designed for use with the UH-34C helicopter. (See fig. 2-12.)

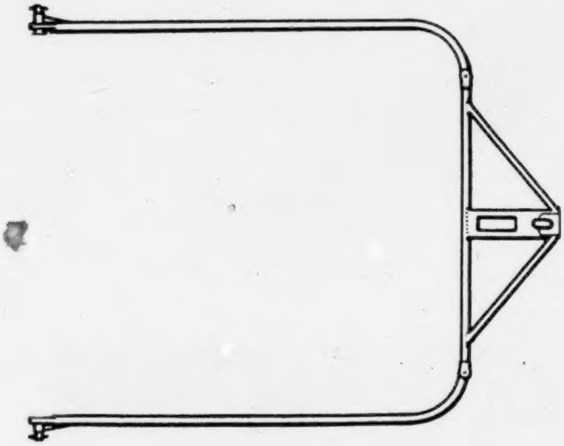

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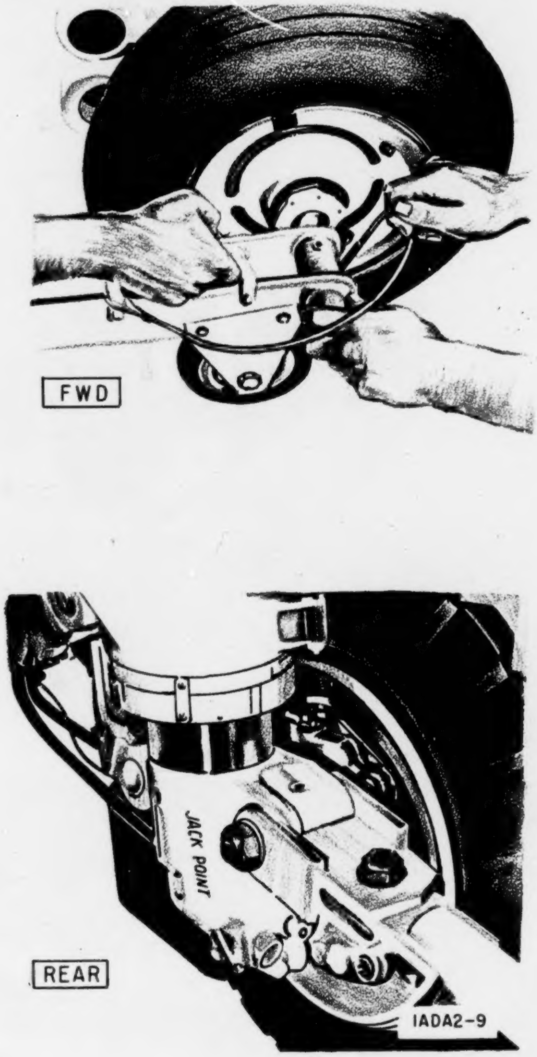
Figure 2-12.—Special Tow Bar for the UH-34.

This tow bar is used to properly steer the helicopter whenever land or shipboard towing is necessary. It is installed on the auxiliary landing gear for towing and steering purposes.

The P-3A aircraft comes under a special category in that it must be towed or steered only by a special tow bar made by the aircraft manufacturer. This tow bar is designed so that when it is installed on the nosewheel landing gear, it unlocks the aircraft steering system. When this bar is removed, the aircraft steering system is automatically restored.

There are two special tow bars for the A-6A; the rearward towing tow bar and the forward towing tow bar. (See fig. 2-13.)



AB.586
Figure 2-13.—Special towbars for the A-6A.

The rearward tow bar for the A-6A is attached to a special fitting on either main landing gear. The tow tractor is positioned alongside the aircraft and tows from that position. A tiller bar or the forward tow bar must be attached to the nosewheel for steering purposes during this operation.

NOTE: Do not exceed 2 mph during rearward towing of the A-6A. Use the aircraft brakes sparingly during towing to prevent damage to the nose and main landing gears.

Information on the tow bar(s) for any given aircraft can be found in the general information section of the Maintenance Instructions Manual for that aircraft.

AIRCRAFT CHOCKS AND TIEDOWNS

Whenever an aircraft is not being moved, the main landing gear wheels should be chocked. The chocks may be universal chocks designed to be used with most carrier based aircraft or special chocks made up by the squadron operating the aircraft.

The universal chock used by the Navy is the Model MWC-2 Universal Wheel Chock. (See fig. 214.) This is an all-metal chock that is adjustable to fit any main landing gear wheel up to 45 inches in diameter.

Special chocks are made and used where standard or universal chocks are of insufficient size. At times, it may be necessary to make chocks for use when there are insufficient standard chocks for the number of aircraft aboard. These chocks can be made from many different materials; for example, wood and line, all wood, or metal tubing and chain.

TD-1A AIRCRAFT TIEDOWN

The TD-1A and the holdback type tiedown use chain as part of the tiedown. The TD-1A tiedown device (fig. 2-15) is used to secure parked aircraft to the deck ashore and afloat. A minimum of four units is used for small aircraft.

To prepare the unit for use, the adjustable hook is extended by rotating the tensioning grip in the opposite direction to the arrows on it. The hook on the chain is inserted in the deck fitting; the hook on the unit is fitted on the aircraft. This tiedown has a capacity of 10,000 pounds and weighs about 12 pounds.

Allowing a small amount of slack in the chain, a link is pushed down into the chain pocket until the chain lock snaps into place. If there is too much slack in the chain, another link can be chosen by pushing the chain lock toward the chain pocket, lifting the chain out, and choosing another link. The tensioning grip is then rotated in the direction of the arrows until the desired tension is reached.

To release, the release lever is pulled up and back in the direction indicated by the arrows.

The TD-1A chain has an oversize link on the end opposite the hook so that chains may be used in series when a longer tiedown is needed.

The holdback type tiedown (fig. 2-16) is used to secure the aircraft to the deck while the engine is being run up to full power for check and adjustments.

The holdback type tiedown consists of a coupler, chain, and a deck fitting. The coupler adapts to the fitting on the aircraft used for the catapult holdback tension bar. The coupler is positive locking on the aircraft fitting. The

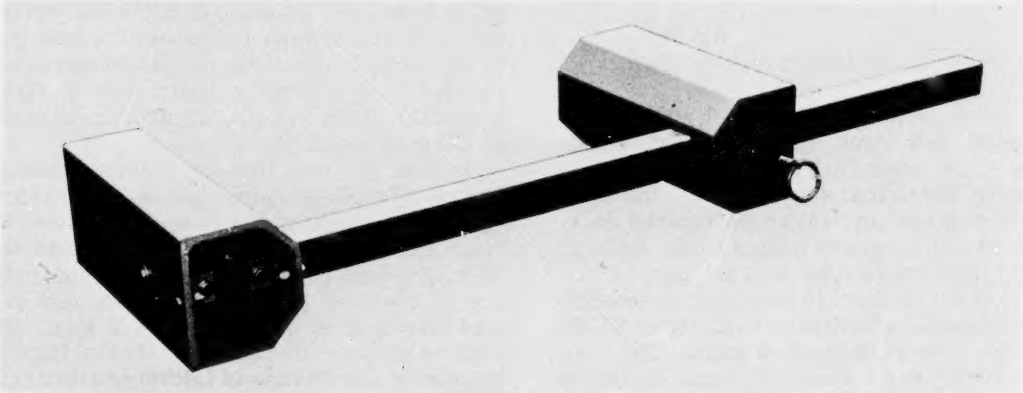


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Figure 2-14.—MWC-2 Universal Wheel Chock.

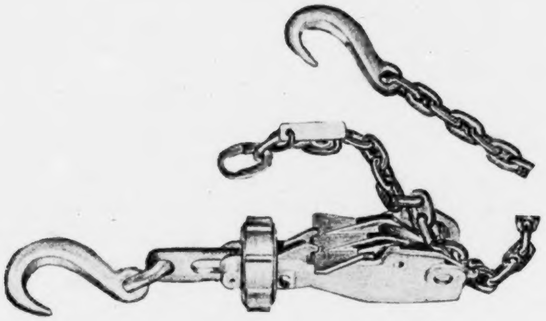

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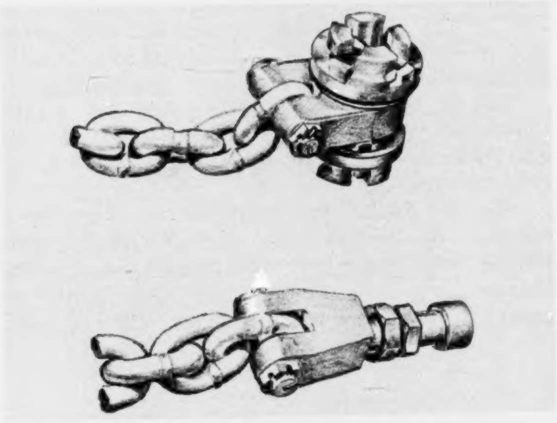
Figure 2-15.—TD-1A all purpose tiedown.



AB.587
Figure 2-16.—Holdback type tiedown.

chain is made of welded links and attaches to the coupler and deck fitting by removable shackles. The deck fitting assembly permits 360 degrees horizontal travel around the deck and 0 to 45 degrees vertical angle from the deck. The deck fitting assembly adapts to the fourbar deck fitting and the fivebar deck fitting.

This tiedown is about 10 feet long and weighs about 102 pounds. The design capacity is 90,000 pounds from 0 to 45 degrees of angle. The fivebar deck fitting has a design strength of 36,000 pounds.

There is also a full power turnup tiedown for the A-5A. This tiedown uses the same deck fitting as the holdback tiedown, but uses two cables with hooks for attaching to the main landing gear towing rigs of the aircraft.

Temporary tiedowns may be made of hemp line or nylon straps. Cargo type nylon securing straps are sometimes used by helicopter crewmen as an initial tiedown when the helicopter touches down. These straps are light, easy to fasten, and quick to tension. They are designed for light loads of 1,000 to 1,200 pounds.

The weight of present day carrier aircraft has increased to the point where they can no longer be adequately secured with line alone; however, the ABH should have a good working knowledge of both nylon and Manila line, as they are frequently used for the securing of gear and equipment and the temporary securing of aircraft aboard ships. Handling of line and the thumb rules for safe working loads are covered in detail in ABH 3 and 2, NavPers 10300-B.

Detailed instructions concerning aircraft handling and securing equipment may be found in NavAir 17-1-537, Technical Manual, Operation and Service Procedures, Aircraft Handling and Securing Equipment. It is recommended that this manual be placed and maintained in the ABH technical library.

AIRCRAFT HOISTING SLINGS

Hoisting slings are used aboard aircraft carriers, as well as by shore stations, to aid in moving aircraft and equipment. Each military aircraft is equipped with lifting points for the attachment of the particular sling designed for use with that model of aircraft. Slings are sometimes used in place of jacks for performing aircraft maintenance and are commonly used to lift aircraft from the pier or barge onto the carrier (either onto the flight deck or elevator platform). They are also used for crash/salvage handling of aircraft.

In that the load bearing cables, chains, or straps of hoisting equipment are subject to wear and/or deterioration, it is necessary that these components be thoroughly inspected and tested at frequent intervals. A complete visual inspection is required prior to each use, and proof-load testing must be carried out at least once a year as directed by NavAir 17-1-114, Handbook, Inspection and Testing of Lifting and Restraining Devices for Aircraft and Related Components.

The general procedure for inspecting slings prior to each use is as follows:

1. All dirt and foreign matter should be removed from the assembly to be inspected, if necessary.

Cables must be inspected for corrosion, kinks, knots, slippage, loosening of fittings, fraying, stretching, or any other signs of failure. Of particular importance is the detection of a cable in which a kink has been pulled through in order to restraighten the cable. The resultant deformation, as shown in figure 2-17, is cause for immediate rejection of the cable.

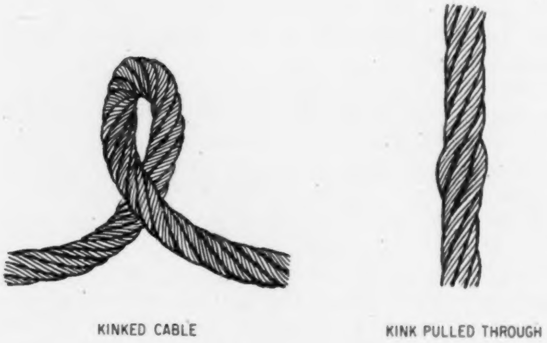


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Figure 2-17.—Cable damage resulting from a pulled through kink.

The presence of 6 or more broken wires in any 9-inch length of cable or 3 broken wires in any one strand 3 inches in length is cause for replacement. If excessive corrosion is present, the cable must be replaced, regardless of the number of broken strands.

Chains used in slings must be inspected for stretching, wear, gouges, fractures, corrosion, kinks, and knots. Chains having more than a 5 percent stretch in any 5-link section must be discarded. Chains which show 25 percent wear in any individual link must also be discarded.

Terminals, lugs, shackles, plates, and other fittings must be checked for misalignment, wear, corrosion, loosening, slippage, fractures, etc. Inspect all bolt holes for elongation and stripped threads. In the case of cable terminals, the lay of the cable beneath the base of the terminal must be examined to insure that the lay is undisturbed and that the individual wires are fitted tightly together.

2. When a fitting is found to be severely corroded, a glass bead type blaster should be used to remove scales. The fitting must then be examined to determine the extent of deterioration. Fittings with severe pitting should be discarded. If fitting is found to be serviceable, it should then be cadmium plated and examined by means of magnetic particle inspection.

3. Zinc-poured terminals must be inspected at the top for slippage of individual wires and for excessive depression in the zinc filling. Wire slippage in zinc may not exceed 1/32 inch, and zinc pullout from the base of terminal may not exceed 1/8 inch.

Proofloading of slings is normally accomplished at Naval Air Rework Facilities (NARF), and are static tested at 1 1/2 times working loads of the sling. It is strongly recommended that a metal tag be securely attached to each sling assembly to reflect the following information:

1. Date of last proofload test.
2. Due date for the next test.
3. Name of testing activity.

SAFETY

Never stand or permit personnel to stand under or near a suspended load or tensioned cable/sling whether testing or during actual hoisting of a load/aircraft. Avoid makeshift repairs of hoisting equipment. Whenever a component is found to be faulty, it must be replaced with a new component designated for that specific purpose. Frequent failures have been caused by using a bolt, pin, or other part of the wrong size or strength as a replacement for a faulty or missing component. After replacement of the faulty part, the entire assembly must be proofload tested.

SCREENING DEFECTIVE EQUIPMENT

The failure of handling equipment during flight operations both ashore and aboard ship can pose many problems for the ABH. At times this can seriously affect the safety of the operation. The first class and chief must know enough about repair procedures to estimate the time the equipment will be out of commission and its effects on the safety of operations.

Whenever a piece of equipment fails, there are several questions that should be answered.

1. What operations will this equipment affect by being unavailable?
2. What can be used in its place?
3. What division or department is involved or who is qualified to effect the repair?

4. How long will it take to repair the equipment (If it is your responsibility to repair the equipment you will need to know how many men will be needed.)
5. Are spare parts available and if they are not, how long will it take to get them?
6. Is the equipment available to perform the repair?

There are numerous sources where information can be found. The Maintenance Requirements Cards as well as the technical manual for each tow tractor and mobile crane should give the time required, the equipment or tools, and the number of men needed to make the repair. The NavShips Technical Manual gives detailed repair procedures for most of the shipboard machinery, piping systems, deck, etc.

Frequent inspections should be made during the performance of the work as well as after completion. The supervisor's inspection should provide affirmative answers to the following:

1. Is the work done according to the current directives?
2. Do technical materials used conform to specifications?
3. Is the job complete in all respects?
4. Does the workmanship measure up to desired standards?

The most effective repair procedure is prevention. A thorough maintenance program continuously carried out and proper operating procedures adhered to, not only promotes safety, but also prevents most equipment failures.

CORROSION CONTROL

In recent years more equipment is being made of metals other than steel or in combinations of several different metals. Tow bars, tow tractor parts, flight decks, chocks, and many parts of ships' structures are being made of aluminum. Since the introduction of steel ships, rust has been, and still is, one of the major problems of maintenance. With the introduction of aluminum and other metals, more problems have been added to corrosion control.

Corrosion may take place over the entire surface of a metal from chemical reaction with the surrounding environment, or it may be electrochemical in nature between two metallic materials or two points on the surface of the same alloy, which may differ in chemical activity. The presence of moisture is essential in both types of attack. The most familiar example of corrosion is the rusting of iron or steel.

Corrosion of aluminum alloy is evident as white or gray powdery deposits on the metal surface. The condition is first indicated by the powdery residue deposited in the area of contact, later by the pitting and scarring of the aluminum surface, and finally complete deterioration of the aluminum in the area.

Corrosion endangers the equipment by reducing the strength and changing the mechanical characteristics of the metals used in its construction. Materials are designed to carry certain loads and withstand given stresses as well as to provide an extra margin of strength for safety. Corrosion can weaken the structure thereby reducing or eliminating this safety factor.

There are many factors that affect the type, speed, cause, and the seriousness of metal corrosion. Some of these corrosion factors can be controlled; others cannot. Preventive maintenance factors such as inspection, cleaning, and painting and preservation are within the control of the operating activity.

When corrosion of equipment or structure has been discovered, the first step to be taken should be the safe and complete removal of the corrosion deposits or replacement of the affected part. Which of these actions to be taken depends upon the degree of corrosion, the extent of damage, the capability to repair or replace, and the availability of replacement parts. Any part which has been damaged by corrosion should be replaced if continued use is likely to result in structural failure. Areas to be treated for corrosion deposit elimination must be clean, unpainted, and free from oil and grease. Chips, burr, flakes of residue, and surface oxides must be removed. However, care must be taken to avoid removing, at the same time, too much of the uncorroded surface metal. Corrosion deposit removal must be complete. Failure to clean away surface debris permits the corrosion process to continue even after refinishing the affected areas.

After the corrosion has been removed the extent of damage must be assessed. It is at this point that the determination is made to repair or replace the affected part or to perform a corrosion correction treatment. This treatment involves the neutralization of any residual corrosion materials that may remain in pits and crevices, and the restoration of permanent protective coatings and paint finishes.

Control of corrosion can be accomplished by maintaining a dry environment through the use of suitable moisture barriers or drying agents.

Complete technical information may be obtained by reference to Corrosion Control for Naval Aircraft, NavWeps 01-1A-509; Aircraft Maintenance Cleaning, NavWeps 01-1A-506; Preservation of Naval Aircraft, NavWeps 15-01-500; and to the manufacturer's instructions furnished with various proprietary materials.

SAFETY

When maintaining or working with equipment, there is one rule that must be strongly stressed: SAFETY FIRST. Whether you are working in the shop, on the line, or on the flight or hangar deck, there are prescribed safety procedures that should be followed. It is a must to be aware of the many dangers that are associated with this type of work.

Because of the possibility of injury to personnel, and the possible damage to material, all repair and maintenance work should be done only by authorized and assigned personnel.

The ABH1 and ABHC should be concerned with the inspection of work areas, tools, and equipment to detect potentially hazardous and unsafe conditions and take appropriate corrective action.

Safety is an area in which the ABH's responsibility increases as he advances in rating. An ABH1 or ABHC must possess the ability to interpret safety directives and precautions. The First Class or Chief must know and observe all safety precautions for the equipment he uses and the work he does.

The importance of interpreting the safety rules and regulations, and either giving your men instructions or publishing them in written form, cannot be stressed too much. However, the indoctrination of your men in safety precautions and techniques is an integral part of the safety program.

CHAPTER 3

AIRCRAFT HANDLING

This chapter covers aircraft handling on naval air stations, aboard aircraft carriers, and LPH/LPD ships.

NAVAL AIR STATIONS

At naval air stations the ABH1 or ABHC may be assigned to the operations department. The term operations, as used here, refers to routine operations concerned with regulating the arrival and departure of aircraft at a naval air station, and not to military tactics. Therefore, senior ABH's may be assigned as flight line leading petty officers.

FLIGHT LINE

The air station line is under the operations department. The line division is responsible for the servicing, loading and unloading, and checking for operational readiness of all aircraft that may be assigned to the naval air station and those transient aircraft that may require these services.

The organization of a naval air station line varies with the number and type of aircraft assigned to the air station. Personnel in the division are assigned as plane captains, taxi signalmen, and equipment operators. On small air stations the men in the division may be required to perform all of these duties. Men from maintenance shops may also be assigned to perform specific checks and other operations.

The line division officer is responsible for the operation of all aircraft and handling equipment on the line and works directly under the operations officer.

The flight line division is responsible for accomplishing the following functions:

1. Line maintenance for assigned aircraft. Line maintenance includes the daily inspections, adjustments, servicing, correction of minor discrepancies, and troubleshooting of aircraft being prepared for flight.
2. Performing line-servicing functions for transiting aircraft.
3. Operating air terminal facilities.
4. Scheduling administrative and proficiency flights.
5. Recommending personnel for assignment as plane captains, directors, equipment operators, and cargo handlers.
6. The security and proper ground handling of aircraft and associated support equipment.
7. Recommending changes in methods and techniques to promote maximum ground safety, safety in flight, and operational readiness of assigned aircraft and associated support equipment.

The leading petty officer in charge is the assistant to the division officer in carrying out the functions of the line. He must keep himself and the line division officer informed of the status of all the aircraft and handling equipment, and any unusual conditions which may exist.

Some of the major duties of a leading petty officer in charge of a line are included in the following list:

1. Direct and spot aircraft on and off the flight line.
2. Insure that aircraft are spotted in accordance with a given operational plan (if required).
3. Insure that adequate firefighting equipment is available and properly manned when starting aircraft.
4. Insure that aircraft are preflighted and ready to go prior to scheduled flights.
5. Maintain status reports on all aircraft assigned to the line.
6. Insure that sufficient auxiliary power units are available for starting aircraft.
7. Maintain flight records as required.
8. Insure that aircraft are fueled and defueled properly, observing all applicable safety precautions.
9. Enforce all safety precautions applicable to flight line operations.
10. Direct the movement of aircraft away from the scene of fires.
11. Insure that aircraft are secured properly.
12. Insure the cleanliness of the line, equipment, and spaces.
13. Train and supervise plane directors.

14. Perform other duties as may be assigned by the department head.

In addition to the above duties, the first class or chief ABH assigned to an air terminal must have a thorough knowledge of aircraft cargo loading procedures and weight limitations of the aircraft concerned.

Personnel assignments are made by the division chief, and all personnel matters are submitted through him to the division officer.

Plane Captains

The plane captain is responsible for the material condition of the particular type aircraft his unit or squadron is utilizing. He should be familiar with the general features of the aircraft and have a practical knowledge of the airframe and powerplant. Through this knowledge gained, he will be able to assist in all phases of required routine engine and airframe periodic checks.

Taxi Signalmen (Plane Director)

Standard taxi signals are used by all branches of the Armed Forces so that there will be no misunderstanding when a taxi signalman of one service is signaling a pilot from another. These signals must be definite and precise to eliminate any possible misunderstanding and to inspire the pilot's confidence in the signalmen. All men assigned to the line should be qualified as taxi signalmen. When the line crew is large, some men may be assigned as taxi signalmen as their primary duty.

Any time an aircraft is to be taxied from the line or is returning to the line for spotting, it must be directed by one or more taxi signalmen as necessary.

The taxi signalman should assume and maintain a position where he can see the pilot's eyes at all times. If it is necessary for him to lose sight on the pilot's eyes in changing positions, or for any other reason, he should signal the pilot to stop until he has taken up his new position.

The taxi signalman has a definite position to maintain when directing aircraft, calculated to give him all possible advantages. His position when directing single-engine aircraft should be slightly ahead of the aircraft and in line with the left wingtip. An alternate position, in line with the right wingtip, may be used when it is necessary to clear obstructions.

When directing aircraft with side-by-side seating, such as is found on multipiloted aircraft, his position is forward of the left wingtip. He has no alternate position since the pilot on a multipiloted aircraft sits on the left-hand side of the cockpit. When directing multipiloted aircraft in obstructed areas, an assistant taxi signalman may be used on the right wingtip. The assistant taxi signalman will signal the aircraft taxi signalman on the left wingtip. The taxi signalman must always be in a position to see the assistant taxi signalman and the pilot's eyes.

Aircraft being taxied on land within 25 feet of obstructions must have a taxi signalman at each wingtip. If any obstruction is present on one side only, a man at that wingtip is required. Aircraft must not be taxied at any time within 5 feet of obstructions. Aircraft being taxied on water must not be taxied closer than 50 feet to obstructions except in mooring or docking procedures or when dictated by nature of the mission. Extra precaution is necessary when directing aircraft at night. The taxi strip and parking area should be inspected for workstands and any other mobile equipment which can damage the aircraft.

In directing an aircraft that is taxiing from the line, the director should remain in control of the aircraft until it is clear of the other aircraft or obstructions in the spotting area.

Equipment Operators

A fully qualified petty officer should be charged with the supervision of the equipment operators and line equipment. The type and amount of aircraft handling and servicing equipment on the line vary with the type and number of aircraft that may be assigned to the naval air station. Operators of all self-propelled vehicles must possess a valid government driver's license (SF-46) and have attended a formal course of instruction on aircraft support equipment (ASE). OpNav 3500.26 (Series) gives detailed instructions on the licensing of ASE operators.

The handling equipment may be one or more of the types discussed in chapter 2 of this training manual. Detailed information on the equipment required for handling and servicing can be found in the General Information and Servicing section of the Maintenance Instructions Manual for the respective aircraft. This manual also gives the handling characteristics and the securing equipment requirements and procedures for the aircraft.

Operators should be cognizant of all safety precautions and vehicle operating instructions issued by the commanding officer of the naval air station and higher authority.

TOWING AIRCRAFT

Towing aircraft can be a hazardous operation, causing damage to the aircraft and injury to personnel, if done recklessly or carelessly. The following paragraphs outline the general procedure for towing aircraft; however, specific instructions for each model of aircraft are detailed in the General Information section of the applicable Maintenance Instructions Manual and should be followed in all instances.

Most naval aviation activities issue specific instructions concerning aircraft towing. These instructions usually contain the composition of the tow crew, tow tractor speed, and various other instructions concerning local conditions. These instructions must be complied with.

Aircraft are generally moved by a tow crew. The crew is usually composed of a tractor driver, plane captain, and one man to watch for clearance at each wingtip and the tail, and a qualified director.

The man assigned to operate the brakes must be thoroughly familiar with the particular type aircraft. His main function is to operate the brakes in case the tow bar should fail or come unhooked. He must also be familiar with the operation of various systems such as the ejection seat, power canopy, wing fold, and the safety precautions associated with each.

The men assigned to observe the wings and tail should proceed at their assigned stations as the aircraft is being towed. It is the responsibility of these men to keep sharp lookout for obstructions and signal the tractor driver in time to prevent collisions.

Only qualified personnel should attempt to tow an aircraft. Driving a tow tractor requires specialized training as well as a valid Navy driver's license.

When towing an aircraft, the towing vehicle speed must be reasonable, and all persons involved in the operation must be alert. Only reliable, competent personnel should be assigned to operate the tow tractors. When the aircraft is being towed, the brakes of the tractor should not be relied upon to stop the aircraft. The man in the cockpit should coordinate the use of the aircraft brakes with those of the tow tractor.

CAUTION: Before towing an aircraft, insure that all landing gear ground safety locks are installed. These ground safety locks are pins and clamps used to insure that the landing gear does not retract accidentally while ground handling the aircraft.

Aircraft are either towed by the fuselage, nosewheel, or the main landing gear, depending on the type of aircraft or the area over which the aircraft is to be towed. Many aircraft are provided with nosewheel steering; therefore, the cockpit steering system should be disengaged if possible when towing by means of the nosewheel.

The universal tow bar may be used to tow aircraft from rings mounted on the fuselage or landing gear. The tow bar is secured to these rings by means of hooks which are mounted on the ends of the bars. A spring-loaded safety pin secures the hooks in the rings.

Special tow bars are designed to be secured to the aircraft in various ways. The information contained in the applicable Maintenance Instructions Manual should always be followed when attaching special tow bars to an aircraft.

SPOTTING AIRCRAFT

It is the responsibility of the ABH assigned to the line crew on an air station to direct and spot aircraft on the line. Sometimes the spot will be painted on the ramp, but in many cases the director will have to be familiar with the area so he can spot the aircraft in such a manner as to facilitate engine turnup, taxiing, or towing without materially endangering other aircraft on the line, and for securing aircraft on the parking ramp.

Incoming aircraft should be met at the edge of the spotting area and directed to the appropriate spot. Transient aircraft often require assistance from the runway to the spotting area. This is accomplished by the use of the follow-me jeep or other appropriate vehicle. The vehicle meets the aircraft at the end of the runway or an intersection to the runway and leads it to the spotting area.

CAUTION: All vehicles entering upon or crossing runways must get radio or visual clearance from the control tower before entering or crossing. Visual signals are used if radio communication is not possible.

An aircraft can be spotted on the flight line under its own power, by use of a tow tractor, or manually by pushing. Regardless of the method used to spot the aircraft, a qualified man must be in the cockpit to operate the brakes.

The position of the taxi signalman during spotting is the same as for taxiing. He must be able to see the eyes of the man in the cockpit at all times.

When spotting aircraft at night, extra precautions must be taken to insure that the parking area is clear of workstands and other equipment. Assistant taxi signalmen should be used to insure that the path is clear and there is no danger of hitting other aircraft or obstructions.

When the aircraft is spotted in its proper position, the brakes should be applied and held until the main landing gear wheels are chocked.

AIRCRAFT TIEDOWN

The tiedown of aircraft is another very important part of ground handling. Aircraft ashore on naval air stations are chocked, and then tied down on concrete parking areas equipped with fittings called pad eyes. The aircraft to be tied down is spotted in the parking area in the best position for full utilization of the pad eyes. The aircraft may be tied down with cable tiedown reels, chain type tiedown, manila line or a combination of all.

When tying down aircraft, the expected weather conditions will determine how the aircraft should be secured. In normal weather the NORMAL TIEDOWN PROCEDURE is used; and when heavy weather is anticipated, the HEAVY WEATHER TIEDOWN PROCEDURE is used.

Since the method of securing and tiedown procedures vary on different type aircraft, refer to the applicable Maintenance Instructions Manual for the proper tiedown procedures.

FIREFIGHTING EQUIPMENT

The ABH1 and ABHC assigned to the flight line duty should prepare himself for possible emergencies by becoming thoroughly familiar with the various types of firefighting equipment available on the line.

Experienced crash crews and fire crews are always readily available; however, the need for the services of the fire crews can, in many cases, be avoided by the prompt and efficient use of firefighting equipment available at all times on the line. It is of the utmost importance that every man working on the line be familiar with the location and use of the firefighting equipment.

Standard color codes are used for visual identification of the fire extinguishers. The use of the standard color code for the extinguishers, promotes greater safety, lessens the chance of error, confusion, or inaction in time of emergency, and also provides identification of the flight line fire extinguishers from building fire equipment.

The type of extinguishers, together with class of fire it will extinguish, must be painted on a 6-inch color band. The letters should be black and at least 1 inch in height.

The 6-inch band around the top of the extinguisher should be painted as follows:

Carbon dioxide (CO_2)	yellow
Foam Compatible Dry Chemical (FCDC)	green
Foam type	silver or white
Purple K Powder	purple

Carts for handling the 50-pound extinguisher bottles should be painted the same color as the extinguisher band. The containers or holders for the other fire extinguishers located on the line may also be painted the same color as the extinguisher band.

The station fire chief is responsible for the proper distribution, maintenance, and inspection of fire extinguishing equipment provided for flight line operation.

The line chief under the station fire chief is responsible for the following:

1. Insure that fire protection measures are provided for all aircraft undergoing maintenance or overhaul on the flight line or parking area.
2. That all line personnel engaged in duties involving aircraft operation be fully trained in fire prevention, fire protection measures, and the use of fire extinguishing equipment.
3. Insure that a sufficient number of properly charged extinguishers are maintained for replacement while flight line extinguishers are being serviced.
4. Require a daily inspection of all line fire extinguishing equipment.

Carbon dioxide (CO_2) bottles are the most common fire extinguishers used on the line. These bottles are supplied in sufficient quantity to handle any small fire started on the line.

An aircraft should never be fueled, defueled, or its engines started without having one or more men standing by with a CO_2 bottle.

Some aircraft carry one or more small CO_2 bottles. These bottles are intended for use in flight and should never be used in ground operations except in extreme emergency. In the event that they are used, the proper personnel must be notified so that they may be replaced prior to the aircraft's next flight.

NOTE: Twinned Agent Units (TAU-2) are provided and should be standing by for immediate use during all aircraft hot refueling operations.

HANDLING AIRCRAFT ON CARRIERS

The two main classifications of aircraft carriers are the attack carrier (CVA) and the antisubmarine warfare support carrier (CVS). Other types of carriers have been developed for specialized and supporting role. Each type carries certain aircraft and equipment designed to fulfill the specific carrier's mission. Those departments which contribute directly to the primary mission of an aircraft carrier are the operations department, weapons department, carrier air wing, and air department.

The combined efforts of both officers and men are necessary to make air operations on a carrier effective. It is certain that without exceptional organization and teamwork on the part of all hands, the operations of an aircraft carrier would not be possible; therefore, the efficient and coordinated efforts of all personnel concerned are of vital importance to the success of all air operations. The success of these operations depends largely on factors such as organization, training, and experience of the senior flight and hangar deck personnel.

During flight operations the speed with which aircraft can be launched or recovered depends largely upon the efficiency of the directors handling the aircraft. The efficiency of the directors depends on the leadership and knowhow of the ABH1 or ABHC who is in charge of them.

The aircraft handling group, under the aircraft handling officer, is responsible for launching, recovering, handling and servicing of all aircraft aboard the carrier. These various functions are the responsibility of more than one division. The two divisions in the aircraft handling group in which the ABH1 or ABHC may be assigned are the V-1 and the V-3 divisions which are responsible for the flight deck and hangar deck, respectively.

FLIGHT DECK

A flight deck of an aircraft carrier is one of the most hazardous places in the world and one of the busiest spots in the Navy. There can be many differences in the flight deck arrangement of aircraft carriers. Equipment may be located differently, be of different size, or be of different type. These differences are even greater between the various classes. The location, size, and type of equipment (elevators for example) can seriously affect the methods of flight deck operations.

The handling of all aircraft on the flight deck is the responsibility of the V-1 division. This includes directing and spotting aircraft, operation of elevators, and operation of aircraft handling equipment such as tractors and cranes.

Also included in the V-1 division is the crash and salvage crew. The major concern of this crew is the handling of crashed aircraft and the manning of firefighting equipment in the event of any emergency situation. The duties and responsibilities of the crash and salvage crew are discussed in chapter 4 of this Rate Training Manual.

There are basic organizations within a V-1 division; one covers the military or administrative aspects and the other the flight quarters or operational organization. All personnel in the V-1 division come under these organizations and their duties may be alike or varied.

The operational organization for a V-1 division covers the flight quarters station assignments. These assignments are outlined in the ship's battle bill. In this organization the division officer becomes the flight deck officer, and the assistant division officer becomes the crash and salvage officer.

The crash salvage chief, safety petty officer, and damage control petty officer are outlined for each organization. This basic organization will vary from ship to ship due to operational requirements, number of personnel in the division, and other factors.

Flight Deck Chief

The flight deck chief (FDC) is the overall supervisor of the flight deck. The FDC is the assistant to the flight deck officer (FDO) and is charged with a tremendous responsibility. The

FDC is responsible for the operations on the flight deck, the training of aircraft directors, proper operation and readiness of all flight deck aircraft handling equipment, and all safety precautions/procedures concerned in any movement of aircraft on the flight deck.

It is not feasible to list all the duties and/or responsibilities of the flight deck chief due to the flexibility of his billet; however, some of the major duties and responsibilities include the following:

1. Conduct prelaunch briefings of plane directors.
2. Supervise flight deck personnel in the spotting, respotting, and securing of all aircraft on the flight deck.
3. Supervise and direct the training of personnel assigned to the flight deck, and administer the division, subject to the direction of the division officer or higher authority.
4. Supervise the movement of aircraft between the flight deck and the hangar deck via the aircraft elevators.
5. Insure that elevator operators and phone talkers are well qualified and have an understanding of and observe all applicable safety orders.
6. Insure that the crash salvage crew mans the appropriate firefighting stations for either flight or respotting operations.
7. Insure that all aircraft handling equipment is in good working order and that the required equipment is readily available.
8. Insure that only qualified, licensed operators are allowed to operate tow tractors, cranes, etc.
9. Enforce the wearing of the prescribed flight deck uniform; paying particular attention to the wearing of goggles, sound attenuators, and other safety devices.
10. Direct the utilization of flight deck handling crews.
11. Conduct and maintain a continuous training program to assure the expeditious and proper performance of the handling crews.
12. Supervise the loading and off-loading of aircraft.
13. Take all necessary action to insure the prompt movement of aircraft to fulfill the requirements of the operational schedule.
14. Keep the division officer advised of all matters concerning safety, status of equipment, performance of personnel, etc.
15. Act as principal observer, inspector, and evaluator of his men's performance.

Leading Flight Deck Petty Officer

The flight deck leading petty officer functions as an assistant to the flight deck chief and has the following duties and responsibilities:

1. Be familiar with all aspects of movement of aircraft on the flight deck and ascertain the training requirements of the handling crews to insure the expeditious movement of aircraft.
2. Supervise the directors and crews in the proper spotting, respotting, and securing of aircraft.
3. Become familiar with all other duties of the flight deck chief.
4. Assume the duties of the flight deck chief in his absence.

Experience has taught that the flight deck chief must be the senior supervisor, but at the same time be one who realizes that the whole job cannot be done alone. The flight deck chief and the flight deck PO, together, must supervise the flight deck until the very last man knows his job and knows it thoroughly.

Flight Operations

In most operations advance word will be given to allow time by planning. However, special missions often arise which necessitate maximum effort on the part of the flight deck crews to get the launch off on time. For this reason the importance of flexibility and broad training of the flight deck crews cannot be overemphasized.

To a person watching flight deck operations for the first time the activity alone presents a confusing picture. Some have called carrier flight deck operations the greatest show on earth. They cannot determine how and why the aircraft are launched and moved around as they are with maximum efficiency. The success of these operations depends largely on factors such as organization, training, experience and sound operating procedures.

There can be no uncertainty on a carrier flight deck at any time during flight operations. Each man must know where he belongs and the job that he is to perform. Orders must be given so that they are clearly understood and carried out.

NOTE: General flight deck and hangar deck procedures are contained in the CVA/CVS NATOPS (Naval Air Training and Operating Standardization). As the title implies, this manual standardizes the procedures for shipboard aircraft handling, and compliance with these procedures is mandatory.

While flight decks are hazardous areas, the danger can be minimized by reducing the chance of a hazard changing into a dangerous situation. This can be accomplished by constantly evaluating ever-changing situations, looking out for the other man first, and developing team effort.

In order to take steps necessary to avoid hazards, the individual must first recognize that these dangers are, in fact, real and could turn into an unpleasant statistic. Once the hazards are recognized they can be dealt with realistically. Applying command policy, standard operating procedures, training principles, and a continuous safety program are the solution.

An indoctrination program for men being introduced to flight deck operations for the first time must be vigorously carried out, and should include air wing personnel. Unauthorized personnel must not be allowed on the flight deck at any time during flight operations.

Every man in the division should know that he is doing one of the most important jobs on the ship—and be mighty proud of it. The grueling work associated with flight deck operations must never be allowed to assume connotations of punishment. An effective and safe flight deck is invariably a disciplined deck. This discipline, which followers know is necessary and want to participate in is intended here, rather than the stern, severe compulsion normally interpreted into the meaning.

As flight deck chief or leading PO, you can insure that there is one thing for which there is no room on the flight deck—carelessness.

OPERATIONS FLIGHT SCHEDULE.—The operations department prepares the flight schedule for each day's operation. For special operations this schedule may cover more than 1 day's operation but normally it is for only 1 day. This schedule is intended to cover the ship's air wings and squadron's training or operational requirements and commitments. A copy of this mimeographed schedule is distributed to all departments/divisions concerned.

This schedule gives the launch and recovery times; the number, type, and squadron of the aircraft in each launch; the fuel loads and ammunition types and quantities; and any other information such as launch sequences, launch priority, and which spare aircraft are required. Ammunition types and loads are usually given in the note section where there is insufficient space on the schedule.

There are many things that can change the schedule during the day's operation or even before the day's operation commences. The schedule must be compiled in advance of the operation (usually 10 to 12 hours); therefore, aircraft status can change, target areas may not be available, or weather may change in the ship's operating area or the target area.

The number of aircraft to be launched must be based on the squadron's maintenance department's prediction of what aircraft will be in an UP status for the coming day's operation. Additional aircraft may be assigned when and if they become available. At times when the expected aircraft do not reach an UP status the whole launch may be canceled or changed. Some missions require an exact number of aircraft. One aircraft in a DOWN status can be the cause for changing the entire mission.

The personnel in charge of the flight deck must be ready to expect a change in the launch sequence or to hold or add certain aircraft at a moment's notice. At times test hops may be added to the schedule at the request of the squadron's maintenance department. All changes to the schedule must be approved by the ship's operation department.

PLANNING THE SPOT FOR FLIGHT OPERATIONS.—Most carriers have a basic spotting order. The aircraft are spotted for launch in approximately the same location each time. This spotting order varies from carrier to carrier to suit the flight deck layout. Certain aircraft must be spotted in a specific location to permit servicing, loading of ammunition, starting, maintenance, etc. In the case of certain large aircraft, the location should be such that the aircraft does not interfere with the movement of other aircraft or is such that they do not need to be moved during launching or recovery operations.

The aircraft handling officer and/or flight deck officer, using the flight schedule, the aircraft status board, and advice from the squadron maintenance chiefs as to what aircraft may be ready, assigns the aircraft by side number to the scheduled launch. The squadron may request specific aircraft but the final decision rests with the aircraft handling officer.

After the decision has been made as to which aircraft are to be used, the aircraft handling officer, flight deck officer, flight deck chief and/or flight deck PO using templates and the ouija (wee-gee) board, decide on the best location for the GO aircraft.

Jet aircraft are usually spotted in a turnup position with the engine exhaust over the side of the deck unless they are spotted on the catapult or in a ready position behind the catapult. Jet aircraft should always be pointed as nearly as possible into the wind for starting. This is to help prevent starting fires and hot starts.

Reciprocating engine aircraft are normally spotted on the aft end of the flight deck with the GO aircraft in the front rows. Jet aircraft are normally spotted along the deck edge with the first to be launched aircraft aft; however, the first to be launched aircraft may also be fed in from the forward spots, depending on the type flight deck.

When there are a very large number of aircraft to be launched some of the GO aircraft may be spotted on the hangar deck, brought up on an elevator during the launch, and started.

When the spot and the operation of the launch are planned, the aircraft handling officer makes a spotting sheet or card to indicate the location of the aircraft. A copy of this sheet or card is given to each director on the flight deck. This card may also contain notes as to specific launching sequences.

PRELAUNCH BRIEFING.—Before each launching operation, a briefing is held by the aircraft handling officer. This briefing is attended by the catapult officer, the flight deck officer, the hangar deck officer, the PO in charge of tow tractors and starting equipment, the flight deck chief, the leading PO, and all flight deck directors and spotters. During this briefing, specific launch procedures and sequences are given. The disposition of aircraft that go "down" during the launch is determined and each director and spotter is informed as to his specific part in the operation. After the briefing, each director informs his crew as to the details of the launch. After the first launch of the day, details of the recovery are also included in this briefing; for as soon as the last aircraft has left the deck the previous launch must be recovered. The crews must also be aware that the need for a "ready" deck may arise at any time due to an emergency situation.

NOSE GEAR LAUNCH (CATAPULT SPOTTING).—The takeoff requirements of jet aircraft necessitate the use of the catapult for launching purposes. With the use of modern catapults, the time interval between each launch depends more on the flight deck directors and catapult spotters than on the catapult(s). The most experienced directors should always be assigned as catapult spotters. There is no room for the smallest error by the spotter if a good launch interval is to be maintained. The position of the aircraft on the catapult is critical. The distance that the aircraft can be off center in relation to the catapult will vary with each type of aircraft but the maximum for any aircraft is about 6 inches. The nosewheel on some aircraft must be perfectly lined up and the aircraft must not be cocked more than a specified amount in relation to the catapult.

Some types of aircraft are equipped with catapult nose gear launch equipment. This equipment provides a safer and more efficient means of aircraft alignment and hookup than the bridle/pendant launch system.

When spotting an aircraft in preparation for launch, having this type launch equipment, direct the aircraft to the mouth of the approach ramp, and signal the pilot to lower the launch bar from taxi position to the deck. The aircraft is then steered into the aft end of the approach ramp and continues forward (not to exceed 4 knots) until the trail bar engages the buffer slider. When the aircraft stops and the launch bar drops into position the catapult deck edge operator is signaled to give bridle tension.

In the event it is necessary to respot an aircraft equipped with nose launch gear (after a catapult hookup) signal the pilot to reduce aircraft power. After all applicable procedures are followed to release the aircraft from the catapult, direct the aircraft forward (under its own power) until the launch bar clears the forward end of the deck ramp (the launch bar will automatically spring up into taxi position). Remove the aircraft from the catapult as directed.

When launching with conventional launching systems, the speed of the aircraft must be controlled by the spotter so that the catapult holdback man is able to connect the holdback. The holdback must not be used to stop the aircraft as any undue strain on the tension bar or ring requires that it be changed. If the aircraft overruns the holdback and the holdback man is unable to connect the holdback, the aircraft must be pushed back manually by a handling crew. Any time that an aircraft must be repositioned, the time for the entire launch interval is greatly increased.

When an aircraft on the catapult goes "down," the spotter and directors must know where to spot it to prevent interference with the rest of the launch. The procedure for removing a DOWN aircraft from the catapult will vary with the flight deck layout, the number of aircraft still to be launched, and the space available on the hangar deck and/or flight deck.

DECK LAUNCHING.—The deck launching method can only be used when the required amount of clear deck can be obtained for takeoff run. When the amount of deck run is determined, it is verified by the air officer, using the tables for each type aircraft. Directors feed aircraft out of the pack to a predetermined spot on the flight deck where the flight deck officer takes over and gives the signal for launching.

The angle portion of the flight deck is sometimes used on carriers to deck launch certain aircraft. This can only be done when the majority of the aircraft are spotted forward on the flight deck and the required takeoff distance can be obtained.

RECOVERY.—When the last aircraft has been launched, the remaining aircraft in the landing area of the deck must be moved. A line painted on the flight deck, known as the safe parking line or "foul line," separates this area from the rest of the deck. No portion of any equipment or aircraft should be in this area. All personnel must remain back of this line during landing operation except those specifically authorized to enter the landing area.

When the aircraft has been released from the arresting gear wire, the fly three director directs the aircraft clear of the landing area. The speed with which the aircraft clears this area has a bearing on the landing interval.

A basic spot is used for recovered aircraft much in the same way as in the launching spot. Experience with spotting the different aircraft assigned the ship determines this spot. As an exact landing sequence cannot be determined in advance, the directors must take the aircraft as they come aboard and spot them in the most feasible locations. These locations should be as close to the basic spot as possible. On large recoveries some of the aircraft must be sent to the hangar deck to give sufficient space for the entire recovery. This is especially true when it is necessary to hold an aircraft on the catapult in a ready-to-launch condition.

When it is possible to determine, in advance, which aircraft are going to be in a down condition upon landing, it may be possible to send these to the hangar deck on recovery. (EXAMPLE: An aircraft going into check.)

An alternate spot should be determined before the recovery for aircraft with blown tires. Some aircraft cannot be taxied any great distance with a blown tire. Some require towing with a tractor because they are impossible to control when taxiing with a blown tire.

A tow tractor should always be kept in a ready condition during recovery operations to tow aircraft from the landing area that have blown tires or some other condition that prevents them from being taxied.

The flight deck handling crews must also be trained and ready to assist in rigging the barricade. The arresting gear crews are responsible for making the hookup but must have assistance from the flight deck crews in stretching the webbing across the flight deck.

RESPOTTING.—The respotting of aircraft on the flight deck becomes an exercise in cooperation between personnel that make up the refueling and rearming crews, squadron personnel, and the plane handlers. The servicing, maintenance, and rearming of the aircraft start as soon as the first aircraft recovered is spotted, and continues through the recovery and respotting periods. The plane director has basic control over these operations due to the required moving of the aircraft. The director must decide if the servicing or other operation on the aircraft is to continue or be halted. Servicing and maintenance must not be allowed to interfere with the orderly flow of aircraft during the respot. On the other hand, servicing and maintenance should not be stopped unnecessarily.

During the respot, DOWN aircraft that would interfere with operations are sent to the hangar deck and aircraft in an UP status needed for the next launch are brought to the flight deck. Respotting of aircraft on the hangar deck for maintenance purposes may be done at this time. It may be necessary to bring some of these aircraft to the flight deck temporarily in order to have room to respot the hangar deck.

When there is space available, aircraft that are not needed for the next launch are sent below. Aircraft are usually respotted in the basic spotting order. At times this order may be modified slightly when a special launch is to be carried out, but normally each squadron will have an area for its aircraft.

During the respot, the directors must be especially watchful to prevent crunches. There is always the likelihood of a crunch when moving aircraft under the adverse conditions of flight operations aboard a carrier. A thorough and vigorous anticrunch program must be carried out and the flight deck chief and flight deck PO are the ones to insure that it is carried out.

The launching, landing, and respotting can be halted at times because of elevator casualties. The term casualties is used here to indicate an inoperative elevator. The elevator platform can be in any position all the way up and locked, down, or any position in between. On some carriers where the elevator platform is part of the landing area, the platform not locked in an UP position can prevent the landing of any aircraft. The launching of aircraft may also be halted when the forward center-of-the-deck elevator cannot be locked in an up position.

The elevator casualty of major concern to the ABH is a casualty to the forward center-of-the-deck elevator. When the locks cannot be installed on an elevator, aircraft should not be taxied across it. When the elevator is down during a recovery it poses a problem in spotting the aircraft as they are recovered. Aircraft must be taxied around it, the area left for spotting is severely limited, and those aircraft that were required to be sent to the hangar deck to make room for the recovery must be sent down another elevator. Additional aircraft have to be sent to the hangar deck to make up for the lost space. The deck edge elevators have to be utilized for this and may seriously affect the landing interval. When the casualty occurs before the recovery, plans can be made to provide for it. When the casualty occurs during the recovery the flight deck chief and leading PO must use all their experience and ingenuity in directing the spotting of the aircraft to insure that all can get aboard.

COMMUNICATIONS.—A rapid, accurate exchange of information is a necessity for a smooth, safe, and efficient flight deck operation. Enough of the plane directors must have radio equipped headsets, and the phone talkers must have phones with leads long enough to obtain a maximum coverage of the flight deck. Good communications then becomes a matter of discipline. Every time an aircraft moves an inch or anything else significant occurs on the flight deck, information should flow smoothly to and from flight deck control. The aircraft handling officer must have this information if he is to maintain control of the operation. The flight deck chief and leading PO must insure discipline on these circuits by maintaining a training program for phone talkers and directors and by exercising a continuous check on their use.

General Safety Precautions

The enforcement of flight deck safety precautions is one of the major duties of the flight deck chief and the leading PO. He must insure that ALL personnel working on the flight deck observe and practice the safety precautions required by the air department instructions and higher authority. This includes personnel of other divisions, departments, and squadrons, as any laxity on their part affects the safety of men, equipment, and the ship.

Nonstandard director signals can cause pilot confusion and create accident hazards; therefore, the first and foremost safety requirement is the use of standard signals. Directors tend to develop their own personal, colorful, and dangerous interpretations of standard taxi signals if they are allowed to do so. It is the responsibility of the ABH1 and ABHC to insure that only the standard signals are used. If any discrepancies are reported, immediate steps must be taken to correct them.

The accident potential takes a tremendous increase during periods of darkness, and requires extra precaution on the part of both pilots and crew. Launches in darkness normally involve the lack of depth perception, which results in error of distance judgment. To compensate for this deficiency, small launches with additional spacing between parked and taxiing aircraft should be standard. The directors must make slower movements with the lighted signal wands to insure the pilot understands clearly the intent of the given signal. A problem which sometimes gets out of hand when not constantly stressed is the director's moving on the deck while giving taxi signals at night. This gives the pilot the illusion he is not moving his aircraft since there is no relative motion between the director and the aircraft. The pilot tends to add more power to respond to the director's signals. When the director stops, the pilot then realizes that he is moving too fast. Thus, the accident potential is increased.

An indoctrination program is utilized for those personnel new to flight deck operations or who have not worked on the flight deck for an extended period of time. New personnel should not be used for night operations until they are thoroughly familiar with day operations.

Strict enforcement of wearing proper flight deck uniforms must be carried out. The correct wearing of helmets, goggles, and sound attenuators is a major problem. Directors and other equivalent personnel should be held responsible for the men in their crews. Personnel working on the flight deck should be prevented from carrying loose gear (books, rags, etc.) in their pockets. There is always the danger of loose gear being drawn into a jet engine intake.

When moving aircraft aboard an aircraft carrier, insure that there is proper clearance, and watch for unexpected ship movement that may have a bearing on aircraft being moved. Be extremely cautious when moving on and off elevators. There is always danger of losing one over the side.

Inattention or improper handling or spotting of the aircraft causes the loss of an aircraft or some unscheduled maintenance.

The problems involved during operations are a product of flight deck crews, pilots, weather, a pitching deck, and last but far from least, tempo of operations. These are elements of the carrier environment and for the most part cannot be altered; however, the number of crunches and hazards can be decreased through alertness, cooperation, and training, and doing the job in a professional manner.

The hazards of a carrier flight deck cannot be overemphasized because of the danger to personnel and property. Safety is an area in which responsibilities increase with advancement. As an ABH1 or ABHC you must know and observe all safety precautions for the equipment you use and the work you do. In addition, it is your responsibility to insure that all men working under your supervision also observe the proper safety rules and procedures. Safety is a never-ending job that must be emphasized so strongly that doing all jobs in a safe manner becomes the accepted and routine procedures at all times.

Safety precautions and directives issued by the commanding officer and higher authority should be followed to the letter in their specific application. It is the responsibility of the flight deck chief or flight deck PO to correctly interpret their application to his men. The major objective of safety precautions is prevention—it is much better to prevent an accident than to give first aid to someone injured. Should any occasion arise in which any doubt exists as to the application of a particular directive or precaution, the measures to be taken are those which will achieve maximum safety.

Flight Deck Crew Safety Clothing and Equipment

For apparent reasons, flight deck life preservers and protective helmets (sound attenuating) should be worn whenever a person works on the flight deck, flight operations, respot, etc. Strict enforcement of wearing proper flight deck uniforms must be carried out. The correct wearing of helmets, goggles, and life preservers is a major problem. Directors and other supervisory personnel should be and are held responsible for the men in their crews, as well as any other person(s) not in proper flight deck attire.

The Mk 1 Life Preserver, designed for use by flight deck personnel, is available in three sizes: small, medium, and large, and in seven colors to designate the various aviation functions. These preservers are comfortable, durable, and washable and should be used to the best advantage.

Information relative to the use and periodic testing of this life preserver (FSN 2H-4220-926-9438 through 9458) can be found in NavShips Technical Manual, chapter 9331. Some of the general inspection and testing procedures pertaining to this preserver are as follows:

1. Examine all mechanical gear on the preserver to insure that it is in working order.
2. Check that the tip of the piercing pins (of the inflater assembly) has not been bent or otherwise damaged.
3. Inflate the preserver orally, examine for leaks. Preservers with leaks or other defects should be repaired or replaced. Holes in the buoyancy chamber can be repaired with the authorized repair kit (FSN 9C-4220-399-6213).

When the life preserver is being worn, it is imperative that it be closed in front with the snaps provided, so that it will not come off in the water. To provide some initial buoyancy, one or two breaths may be blown into the buoyancy chamber orally (but only when the increased bulk of the preserver, due to the partial inflation, does not become a work hazard).

Lifevests must be kept away from oil, paint, and greasy substances as much as possible since these materials can accelerate deterioration of the fabrics in the preserver. Sharp edges of various items about the flight deck are "wear and tear" hazards to be avoided.

Protective headgear and goggles are also a must item to be included in proper flight deck uniforms. In short, they are good insurance in reducing personnel injuries.

HANGAR DECK

The operations of an aircraft carrier would be almost impossible without a smoothly and efficiently operating hangar deck crew. The movement of aircraft on the hangar deck creates special problems due to the limitations of space. Therefore, a great deal of advanced planning must go into the spotting of aircraft to prevent the blocking of UP aircraft with DOWN aircraft and those that cannot be moved. The close quarters and irregular shape of the hangar deck areas require the constant attention of the directors and handlers to prevent crunches. The handling equipment for the hangar deck is mostly manpower; however, the spotting dolly can, while providing maximum maneuverability, spot aircraft equally effective in congested areas as in the open. There is not room in most cases for tow tractors.

The V-3 division organization is much the same as that of the flight deck. It is also based on two organizations—administration and operation. The main difference is in the number of men assigned. There are fewer handling crews but the number of men in each crew should be greater due to the fact that most of the movement of aircraft is done by manpower.

The hangar deck division is charged with the handling of all aircraft on the hangar deck. Other responsibilities include operation of aircraft elevators, hangar bay doors, roller curtains, and assigned firefighting equipment such as sprinkler systems, water curtains, and foam monitors. Certain personnel from V-3 division man the conflagration control stations on the hangar deck.

Duties of the hangar deck chief and the leading PO are basically the same as those of their counterparts on the flight deck.

Flight Operations

The hangar deck officer, with the assistance of the hangar deck chief, is responsible for the movement of all aircraft from, onto, and on the hangar deck. The movement of any aircraft must be coordinated through the aircraft handling officer.

There are two types of spotting that concern the hangar deck handling crews: operational and maintenance spotting.

OPERATIONAL SPOTS.—Aircraft that are not needed for a launch may be sent to the hangar deck to increase the amount of room for operations on the flight deck. These aircraft will normally be needed for the next launch on the flight deck and must be readily available to be sent back to the flight deck. Care must be taken in choosing their spots so that this movement is not blocked.

Information as to the UP or DOWN status of the aircraft must be given to the hangar deck officer or chief at the time or before the aircraft is sent to the hangar deck. The flight deck personnel must cooperate in the operation in sending the aircraft in a sequence most advantageous to the hangar deck. At times it may be necessary to send some aircraft from the hangar deck to the flight deck and then return them to the hangar deck with the additional aircraft. This is to prevent "burying" UP aircraft behind DOWN aircraft. Servicing of some aircraft is also required on the hangar deck. Spotters of the aircraft must take this into consideration. Care must be taken to prevent crunches while moving the aircraft. Care must also be taken in the spotting so that overlapping wing and tail surfaces are not forced together due to an increase in weight of the aircraft when fuel is put into the tanks of the aircraft with its wing on top. The reverse can happen when defueling an aircraft and its wing is on the bottom.

At times the aircraft may be sent to the hangar deck just for refueling or defueling. Care should be taken in spotting so the tank openings are not blocked, making the operation impossible.

MAINTENANCE SPOTTING.—The spotting of aircraft for maintenance on the hangar deck is the largest problem of the hangar deck crews. The condition of the aircraft undergoing a "check," extensive maintenance, or repair may prevent its being moved. When the aircraft must be placed on jacks, only a certain area of the hangar deck can be used because of the lowness of the overhead in most areas. Aircraft undergoing an engine change or check will require additional space to perform the work. On some jet engined aircraft, this requires considerable space. No aircraft maintenance that will keep the aircraft from being moved should be undertaken without the approval of the hangar deck officer or chief and the aircraft handling officer; no matter how much or little time is required for the work to be performed.

Cooperation between the hangar deck chief, flight deck chief, aviation fuels chief, and the squadron maintenance chief is a must if the hangar deck is to operate smoothly and efficiently. The hangar deck chief is responsible for the movement of all aircraft on the hangar deck. It is necessary that he be informed of any operation requiring the movement or preventing the movement of any aircraft on the hangar deck.

Safety Precautions

Safety precautions for the hangar deck are much the same as for the flight deck. Aircraft must be moved into and out of tighter areas on the hangar deck than on the flight deck and movement of the aircraft in most cases is by manpower alone. All the fire hazards present on the flight deck are present on the hangar deck plus the disadvantage of restricted movement.

One of the major responsibilities of the hangar deck chief and leading PO is the enforcing of the ship's regulations and safety precautions on the hangar deck.

Some of the safety precautions for the hangar deck are as follows:

1. All equipment, machinery, and gear that are not being moved or used must be securely tied down.
2. All tiedowns that may be in an area used as a passageway should be marked with a rag or other device to increase their visibility. The sharp trailing edges of wings and horizontal tail surfaces that may be positioned in such a way that they are not readily visible should be padded or marked.
3. When moving an aircraft, make sure that a qualified plane captain is in the cockpit and that he is fully aware that the aircraft is to be moved.
4. There should be a safety man stationed at any point of the aircraft that cannot be seen by the director. When there is any doubt as to clearance, stop the aircraft and make sure of adequate clearance before proceeding. Be especially watchful of the clearance between the vertical fin of the aircraft and the overhead.
5. Make sure that there is a sufficient number of men to handle the aircraft when moving it.
6. When an aircraft is to be turned up on the hangar deck, make sure that permission has been obtained from the aircraft handling officer in flight deck control and that all ship's regulations are observed. Safety men from the squadron, with sufficient line to block off the area, must be stationed around the aircraft.

Each ship has safety precautions that are unique to that ship due to special circumstances and operational requirements. Each petty officer of the division must know and enforce those that apply to him and his men. New men coming into the division should be required to read and sign a listing of these precautions.

LPH/LPD HELICOPTER HANDLING

Other carriers of a specialized nature are the LPH (Amphibious Assault) and LPD (Amphibious Transport Dock) type. These ships are to support the vertical envelopment phase of amphibious operation. The LPH and LPD transports and lands troops, equipment, and supplies, utilizing transport helicopters, landing craft, and amphibian vehicles.

The first LPH, the Thetis Bay, was converted from an escort carrier. Some Essex class carriers have been converted to amphibious assault ships. Some other LPH's have been built from the keel up for this specialized mission. The first one built from the keel up was the Iwo Jima (LPH2).

The first LPD, the Raleigh, was built from the keel. The LPD has a wet well for launching large landing craft as well as a flight deck for launching and landing helicopters. There are no facilities on this type ship for striking helicopters below deck. An LPD usually teams up with an LPH (when air transportation is required for troops, equipment, etc.), and utilizes the helicopters from the LPH.

The ABH assigned duty on an LPH is assigned to either the V-1 or the V-3 division. The air department for this type ship is basically the same as the CVA/CVS class carrier. The air department on the LPD has only one V division, and usually all aviation ratings are assigned to this division. The ABH's duties include directing helicopters during launching and landing operations and other duties as may be assigned.

General flight deck and hangar deck procedures are contained in applicable LPH and carrier NATOPS Manuals. These may be referred to for specific type aircraft. Some general procedures are as follows:

1. Personnel not required for plane handling must remain clear of the flight deck during launching and recovery operations.
2. Starting the auxiliary powerplant, engines, rotor turnup, and taxiing will be done upon the direction of personnel from the ships air department.
3. There must be maximum safe relative wind conditions for unfolding or folding rotor blades.
4. Extreme caution must be exercised during preflight inspections and flight operations.
5. All flight deck operations are executed on signals from Primary Flight Control.
6. Taxiing and movement of helicopters will be under the positive control of the directors.

Under normal conditions, while directing the taxiing of helicopters, the director will at all times assume and maintain a position from which the eyes of the pilot are visible. Normally this position will be forward and to the right of the nose of the helicopter, immediately outboard of the rotor blade tip path. Under specific conditions (such as may occur aboard a carrier), the director will assume a position best suited to the specific environment.

Handling a helicopter aboard ship requires strict adherence to safety measures and trained handling crews, utilizing standard procedures and signals. A great deal of special handling of helicopters is required for safe and efficient operation; precautions must be practiced and observed in all movement to preclude the possibility of injury and/or damage.

Night operations are always the most critical for both pilots and the flight deck crews. The tempo of operations must be reduced in both volume and speed when compared to the day operations. Slow and careful handling of helicopters by the flight deck crews is mandatory; therefore, particular attention must be given to insure that all personnel involved in flight deck operations are well briefed in their duties and procedures.

Movement of helicopters will be accomplished, when feasible, by using a two tractor equipped with an appropriate tow bar. As an example for towing procedure, the CH46A type helicopter is given. The aircraft may be towed by the nosewheel using a Navy Universal Tow bar. Full 360 degrees swivelling of the nose gear shimmy damper enables the helicopter to be towed with the scissors assembly connected. When directing the towing of the helicopter, the director will assume and maintain a position in front and to the right of the helicopter (outboard of rotor tip path), keeping the eyes of the pilot/crewmember and the driver of the tow vehicle visible at all times. Tow the helicopter using the procedures as follows:

1. Insure that external power and obstacles are removed, and the cockpit is manned by qualified personnel to apply brakes when necessary.
2. Close all access panels and doors to prevent damage to helicopter.
3. Remove loose objects that could fall from the helicopter during towing.
4. In congested areas, one crewmember should be placed at the left-hand side of the helicopter just outboard of the rotor blade tip path in sight of the director. All signals from crewmember will be directed to the plane director.
5. Connect the tow bar to the helicopter and the tow vehicle. Remove all tiedowns and wheel chocks.
6. Release the parking brakes, unlock the nosewheel and, if towing at night, turn the navigation lights ON.
7. Do not start or stop too suddenly. Tow the helicopter straight ahead before turning. Do not exceed maximum speed of 5 mph during towing.
8. Tow the helicopter smoothly and do not use the helicopter brakes for steering.
9. Use brakes only when necessary, as this may cause wheels to overheat. If the helicopter brakes must be used for emergency stopping, apply the brakes evenly to avoid swerving and subsequent damage to the helicopter.
10. When towing is completed, place chocks fore and aft of each landing gear, set the parking brake, and disconnect the tow bar from the tow vehicle and helicopter.

When the tractor is not practical, pushing crews may be used. These crews must be instructed as to those areas of the aircraft that are capable of taking external forces. In all cases of deck movement, a crewmember must be in the cockpit to insure that the helicopter is moved at a slow and safe speed.

For detailed towing procedures for different type helicopters, consult the applicable Maintenance Instructions Manual (General Information section).

Table 3—1.—Helicopter launch and land commands.

Evolution	Command from fly control	Display at fly control	Meaning/action
Preparation to start engines.	"Check tiedowns, chocks, and all loose gear about."	Red flag and red light.	Verify tiedowns on, chocks in place. Bootman untie boot lines and handhold lines. Secure all loose gear. Man fire extinguishers.
Start engines.	"Start engines."	Red flag and red light.	Authority for responsible flight deck personnel to signal for starting of, engines. Ship not ready for flight operations.
Engage/disengage rotors.	"Stand clear of helicopter (s)"—(20-second pause). "Engage/disengage rotors."	Red flag and red light.	Deck is clear of all personnel not required. Authority for responsible flight deck personnel to signal for engaging rotors when their immediate area is clear. Ship not ready for flight operations.
Launch.	"Launch helicopter (s)."	Green flag and green light.	Ship is ready in all respects for flight operations. Authority for responsible flight deck personnel to launch helicopter when pilot is ready and tiedowns removed.
Helicopter (s) approaching for landing aboard.	"Prepare to land helicopter (s)."	Red flag and red light.	Prepare designated landing area to land helicopter (s). Ship is not ready.
Recovery.	"Land helicopter (s)."	Green flag and green light.	Ship is ready in all respects to land helicopter (s).

FLIGHT DECK PROCEDURES

All flight deck operations, including starting of the auxiliary powerplant, engines, engaging rotors, removing tiedowns, etc., are executed on signals from PriFly via the director.

The preparation for starting the auxiliary powerplant and engines should be accomplished by the helicopter crew immediately after they enter the helicopter, and when PriFly issues instructions to start engines, the director gives the start engine signal to the pilot; the pilot then starts the engine. A visual signal will be passed to PriFly via the director as soon as the pilot determines that he is ready to engage rotors. The rotors will be engaged only upon the signal from PriFly to the pilot via the director. The following requirements are mandatory for engagement of the rotors:

1. Rotor blade tiedowns removed.
2. Deck tiedowns secure and chocks in place.
3. Flight deck area clear of all unnecessary personnel and loose gear.
4. Nosewheel locked and parking brake on.
5. Required relative wind velocity.

After the rotor engagement is completed and the pilot is ready for takeoff, he will indicate an "up status" signal to the helicopter director. Following an UP status signal, and when directed by PriFly, the tiedowns will be removed. As soon as practical after the tiedowns are removed, the director signals the pilot for takeoff.

When PriFly issues instructions to prepare to land a helicopter the director and handling crew take up their stations in the designated area, and when the ship is steady on course and ready to receive the helicopter, PriFly issues instructions to land the helicopter. Normally the approach of the helicopter will be from the 180-degree position, and will be near a hover attitude with a minimum rate of closure as it crosses the deck edge of the ship and comes to a hover over the designated landing area. Touchdown on the designated landing spot will be made when the director gives the appropriate signal. See table 3-1 for the sequence of signals between director and PriFly and vice versa.

The signals for a normal sequence of action during launching and recovery operations are given in ABH 3 & 2, NavPers 10300-B. At times there may be changes to these signals; therefore, always refer to the latest edition of NWIP 41-6 for approved helicopter signals.

Launching and recovery procedures are basically the same for LPD ships; however, due to the configuration of these ships (limited deck space, gun mounts, cranes, etc.), the director may launch the helicopter to either port or starboard.

In general, flight deck operations may cause some confusion between pilots/crew and the helicopter directors. All signals must be clearly understood by everyone concerned so as not to leave any doubt about procedures. When in doubt, stop and find out; this is especially important in the movement of helicopters.

CHAPTER 4

AIRCRAFT CRASHES, FIREFIGHTING, AND CREW ENTRAPMENT

This chapter discusses the duties, responsibilities, and organizational structure of Aircraft Fire/Rescue crews (both ashore and aboard aircraft carriers). Information concerning emergency fire/rescue equipment, aircraft crashes, aircrew entrapment, and rescue procedures is included.

NAVAL AIR STATIONS

One of the primary command responsibilities of each naval shore activity is to maintain a reliable and effective firefighting organization of personnel and equipment.

On naval air activities, consideration is given to the two primary types of fires encountered—the aircraft fire and the structural fire. Each type requires different firefighting materials and procedures to effect rapid extinguishment.

The fighting of fires in and around grounded or crashed aircraft is a highly specialized branch of firefighting, which demands skill, courage, teamwork, physical agility, and mental alertness, and thus extends a challenge to firefighting and rescue personnel.

Fire may occur at any time during the operation or servicing of aircraft, but fires are especially critical following a crash, either on takeoff or landing. This type of fire spreads rapidly, and because of the unusual fuel dispersion and flame intensity, presents a severe hazard to the lives of those inside the aircraft.

An aircraft crash fire can occur on a variety of terrains and can involve high-test gasoline or jet fuels, rocket fuels, nuclear weapons, lubricating oil, and a fuselage damaged to varying extents. Combustion is sudden, backflashes are common, and explosions are a constant hazard to personnel and equipment.

Structural fires, on the other hand, are confined within buildings, usually are progressive in nature, and usually create a greater smoke hazard. These differences necessitate different methods of approach, removal of hazards, and extinguishing agents and procedures than for crash firefighting. As a result, extinguishment becomes a job for individual, specialized units. This specialization is necessary because the two types of firefighting differ greatly in many ways.

Special equipment is required for aircraft crash rescue because of these differences in types of fire and techniques of extinguishment. The crash crew employs trucks, helicopters, extinguishing agents, and tools not ordinarily utilized by a structural fire crew. The quantity of extinguishing agents is limited for the crash crew. Normally, an unlimited water supply from hydrants and other sources is available to the structural fire crew, but for the aircraft crash crew the required fire extinguishing agents usually are limited to the capacities of the crash crew trucks and airlift equipment.

Each crash crewman assigned to the firefighting department is to be trained in both crash firefighting and structural firefighting. The primary duty of any firefighter is saving LIFE: the secondary duty is to extinguish and limit damage by fire. To help the firefighter meet these responsibilities, the Navy has placed at his disposal the finest equipment available with the latest developments in this specialized science. Through continuous study and practice, the firefighter should master this specific art of firefighting so that he can operate with a maximum of speed and at the optimum of efficiency.

CRASH-RESCUE SERVICE ORGANIZATION

It is a primary responsibility of each Naval Air Facility to maintain adequate, reliable, and effective organizations of personnel and equipment to furnish emergency protective services in accordance with standard procedures. The basic standards are implemented by appropriate instructions as required to meet local situations and missions. It is the responsibility of each commanding officer to publish a detailed aircraft firefighting and rescue procedure, which follows the basic policies outlined by the Naval Air Systems Command. This detailed procedure must be posted at each location where aircraft emergency calls are received.

All personnel concerned with aircraft firefighting and rescue operations are listed in the Station Aircraft Firefighting and Rescue Procedure. This procedure outlines the responsibilities, requirements, and general procedures to meet local situations and missions.

Station Fire Chief

Each air station within the continental United States employs a civilian fire chief who is responsible for the operational readiness and performance of the crash-rescue organization. The fire chief, or designated crash captain, has control and command of the firefighting and rescue operation at the immediate scene of the accident. The air operations officer assumes overall coordination control of movement of aircraft, crash-rescue equipment, and other personnel and equipment involved on the field other than immediate scene of the accident.

Training and Drills

Aircraft crash accidents and emergencies usually occur suddenly and with a minimum of advance warning. They permit no extensive on-the-scene preparation. Time and exacting operations with minimum waste motion or extinguishing materials are of extreme importance. Standard, comprehensive, and constant training must be afforded all crash firefighting and rescue personnel through a continuous on-the-job training program. Care must be exercised in the duty assignment of recruits and otherwise inexperienced and untrained personnel lest their actions unnecessarily impede action or possibly jeopardize the lives of crash aircraft occupants or fellow personnel.

RESPONSIBILITY FOR TRAINING.—The crash fire chief is responsible for the continuous training of all aircraft firefighting and rescue personnel and crews, and other supporting personnel in accordance with NavAir Instructions and the mission of the activity.

All personnel engaged in duties incidental to aircraft operation (maintenance and servicing) will be periodically instructed in fire prevention and protection measures. This will include squadrons on temporary duty.

Personnel engaged in duties incidental to aircraft operations (maintenance, refueling, and servicing) on the flight line will be instructed in the types of extinguishers and their operation, care, and proper application with reference to the following types of fires:

1. Aviation fuel fires.
2. Compressor compartment fires.
3. Accessory section fires.
4. Aft fuselage fires.
5. Aircraft wheel and brake fires.
6. Tailpipe fires.
7. Tire fires.

TRAINING PROGRAM.—A comprehensive training program should include instruction and training in the following:

1. Firefighting and rescue organization outline.
2. Aircraft emergency mobilization procedures.
3. Fundamentals of combustion, fire control, and extinguishment; particularly as involved in aircraft fuels, materials, and explosives.
4. Firefighting operations and tactics.
5. Aircraft identification, arrangement, and characteristics familiarization.
6. Basic rescue and first aid procedures.
7. Actual burning practice in simulated aircraft fire emergencies.
8. Review and discussion of past accident operations.
9. Fire hazards involving aviation fuels.
10. Preparation and submission of aircraft/rescue reports.
11. Driver-operator instructions.
12. Ordnance. (The Ordnance/Weapons Officer will give special instructions on ordnance in accordance with the activity's mission and facilities supported.)
13. Characteristics of commercial jet aircraft which, in the event of an emergency, may land at Navy or Marine Corps air facilities.

TRAINING AIDS.—Applicable training manuals, directives, films, visual aids, and other material published by the Government departments and aircraft manufacturers should be utilized to the maximum extent in the training program. Results of actual tests, personal experiences and observations, and knowledge of specific characteristics of various types of aircraft should be incorporated into local fabricated training aid devices, demonstrations, and charts to augment published manuals. Aircraft familiarization kits, charts, and cutaways are valuable training aids. Local medical, aircraft maintenance, ordnance, operations, and other related services should be enlisted to cooperate in conducting appropriate training phases.

An adequately planned and suitably located training ground for actual burning practice and simulated crash operations is essential at each naval air activity. In developing each training grounds site, due consideration should be given to location with respect to the airfield, to assure noninterference with flying operations and, at the same time, to provide rapid availability of the personnel for emergency response.

Training fires and realistic forcible entry into and rescue from burning aircraft should be used to the extent necessary to attain and maintain the desired standards of proficiency.

Emergency Communications System

The emergency communications system must be reliable and rapid. The system should include crash firefighting and rescue crews, crash ambulance crews, and other personnel and activities requiring notification. It should also provide communications between mobile emergency units and control fixed stations.

Radio Equipment. Radio equipment is allocated for specific use of aircraft fire/rescue organizations. The aircraft fire/rescue network is for emergency communications ONLY, and is not to be used for any other reason such as administrative or industrial purposes. Fixed transceivers are authorized for the following:

1. Aircraft control tower.
2. Aircraft fire/rescue alarm room (crash shack).
3. Structural fire station where structural and aircraft fire/rescue units are not housed in one common structure.

The following mobile transceivers for the fire/rescue network are authorized:

1. Aircraft fire/rescue trucks or vehicles.
2. Fire chief's vehicle; dual installation on the aircraft fire/rescue network and internal security or other fire network.
3. Crash ambulance.
4. Runway foamer/nurse truck.
5. Rescue boats (if applicable).
6. Other vehicles that the commanding officer deems necessary to support aircraft fire/rescue and/or salvage operations.

NOTE: Suitable portable or mounted mobile equipment should be provided in sufficient quantity to enable communications between the crash vehicle convoy and SAR (Search and Rescue) boats and/or aircraft when operating within the range of the control tower or the crash communications control station.

Primary Aircraft Emergency Alarm Intercommunications System. The PRIMARY crash alarm system, in addition to the radio equipment described above, consists of a direct wire communications system installed at the following locations:

1. Aircraft control tower.
2. Air operations dispatcher.
3. Aircraft fire/rescue alarm room (crash shack).
4. Structural fire organization alarm room.
5. Air operations duty office.
6. Station hospital or dispensary.

The purpose of this system is to afford an immediate means of communications to primary emergency activities, and to notify the operations dispatcher so that he may in turn notify all essential supporting activities.

Secondary Aircraft Emergency Alarm Intercommunications System. This system may operate through the regular telephone switchboard, and the commanding instrument is generally located at the operations dispatcher's desk. Instruments on this system are installed as required at specific locations, thus permitting notification of all essential personnel and activities simultaneously by the operations dispatcher without interference with control tower or primary crash alarm operator's duties. Stations served by the crash alarm telephone system are variable and at the discretion of the commanding officer. The following connected stations are suggested:

1. Crash-rescue alarm room.
2. Structural fire station.
3. Hospital or dispensary.
4. Photographic laboratory.
5. Aircraft maintenance department.
6. Crash boat house (if applicable).
7. Security Office.
8. Airfield operations office, which in turn notifies by regular telephone or other means:
    a. Aircraft accident board members.
    b. Aviation safety office.
9. Duty officer's office, where by regular telephone or other means the following personnel are notified:
    a. Commanding officer.
    b. Staff officers as required.
    c. Chaplain.
    d. Information services officer.

e. Other agencies whose presence at an aircraft accident is declared necessary by the commanding officer.

It is the responsibility of the control tower to observe and report emergencies to the crash crew. This does not relieve crash crews ON RUNWAY ALERT of the responsibility for maintaining constant observation since, particularly during active flying periods, many instances may escape the initial notice of the tower operator. Crash crews dispersed on alert assignment or actual response will monitor the crash communications control center, or air traffic control tower, as appropriate.

In the event of a crash or notification of impending emergency, on or off base, upon which the tower operator received initial notice, he immediately notifies listening members of the crash crew by radio or over the primary crash intercommunications system, consistent with circumstances. As far as can be ascertained, the crash crew, including ambulance, is furnished complete information concerning location, type of aircraft, occupants, type of cargo carried (especially if any explosives are aboard), amount of fuel aboard, nature of the emergency, landing runway and time, and such other information as is pertinent to the anticipated emergency operation. This information may be obtained by monitoring air traffic control and by tower operator's repeatback. Upon receipt of initial notification, crash crews and ambulance respond immediately and, if the incident is an impending emergency, they assume standby positions at predetermined emergency locations alongside, but clear of designated runway.

Simultaneous with notification of crash truck and ambulance crews, the operations dispatcher is notified over the primary crash intercommunications system. The operations dispatcher then notifies other designated activities over the secondary crash intercommunications system.

If information of a crash or emergency is received by the crash crews or operations dispatcher before the control tower, the tower operator is immediately notified by radio or intercommunications system and crash firefighting vehicles and ambulance proceed to the crash or emergency location.

Maintenance of Alert

It is mandatory that aircraft firefighting and rescue crews, with ample equipment, be maintained on an ABSOLUTE alert status during all scheduled periods of recurrent flying activity. The location of the alert station will vary between naval air activities and with circumstances.

1. Runway Alert. A runway alert must be maintained at all times that runways are in use to provide timely rescue of personnel involved in unanticipated emergencies, and to report any suspected malfunction of aircraft to the aircraft control tower. This runway alert must be strategically located in order to observe the entire runway in use and respond immediately to an emergency.

NOTE: Where landings and/or takeoffs are being conducted simultaneously, or where more than one runway is in use and operations cannot be observed from a single vantage point, a second runway alert is required.

The runway alert must consist of a fully manned MB-5 or, where an MB-5 is not available, a truck-mounted twinned agent unit (TAU) with a crew of four men may be utilized as a interim measure. At air activities where the aircraft maximum gross takeoff weight is 10,000 pounds or less (table 4-1, gross weight category), the TAU with a crew of four men may be used as the runway alert in lieu of the MB-5.

Runway alert watches may be established in a number of watch hour combinations, dependent upon intensity of operations and weather conditions. No one fire/rescue crewman, however, is to be assigned to runway alert duty for more than a total of 8 hours in any one 24-hour period.

2. Standby Alert. The purpose of the standby alert is to supplement the runway alert in meeting minimum response requirements, and to provide firefighting capability required to minimize danger to flight personnel, and to reduce fire damage to aircraft involved in an accident. A standby alert must be maintained at all times during flight operations and will consist of an ambulance, MB vehicles, and runway foamer. Where the combined fire organization is located in common quarters, or the structural fire station is so located as to permit response within the time prescribed for standby alert (3 minutes from the standby position to the field alert position), one MB-5 and/or the runway foamer will be cross manned by personnel normally assigned structural firefighting duties. However, at least one structural fire pumper must be maintained in a fully manned condition at all

Table 4-1.—Minimum response requirements.

Aircraft maximum gross takeoff weight in pounds	Gross weight category	Gallons and pumping rate of water for foam generation—AFFF-GALS/GPM
Up to 10,000	1	400/250
10,000 to 60,000	2	800/500
60,000 to 90,000	3	1200/750
90,000 to 200,000	4	1800/1000
200,000 and over	5	2400/1250

NOTE: This table supersedes minimum response requirements as set forth in NavAir 00-80R-14, U.S. Navy Aircraft Firefighting and Rescue Manual, dated 1 January 1968.

times to permit ready response to structural fire emergencies.

On notification of an anticipated or impending emergency landing, the standby alert must assume the condition of readiness of the runway alert at a strategic position near the anticipated emergency location.

3. Backup Standby Alert. During flight operations, a backup standby alert consisting of other medical/ambulance personnel, ordnance disposal teams and vehicles, and the structural fire organization must be maintained in a condition of readiness that will permit prompt response from normal working areas to a standby alert position. On notification of an emergency or other anticipated aircraft malfunction, these forces will assume the condition of readiness of the standby alert and await instructions from the senior fire officer at the scene of the emergency.

4. Mutual Assistance. In addition to the support and utilization of the structural fire crews and equipment, cooperation and mutual assistance between Department of Defense Agencies and between Naval and Marine Corps activities are essential. Coordination and cooperation between local military, civilian airport, and municipal firefighting organizations are encouraged. Local commanders are enjoined to cooperate with forest service, state, and local fire officials in developing plans to furnish mutual assistance to an extent which would not impair the safety of the military facility involved.

5. Minimum Response. Table 4-1 contains the minimum response necessary to adequately perform the aircraft fire/rescue function for routine flight operations. This table establishes minimum response in number of gallons and pumping rate based on use of the fire extinguishing agent, AFFF (Aqueous Film Forming Foam). This is the standard extinguishing agent used by the Navy. (Protein foam is still used for runway foaming operations.) If for any reason the minimum response water requirements cannot be provided by the runway and/or standby alert as specified in the preceding paragraphs, the commanding officer concerned should curtail or reduce flight operations to a gross weight category of aircraft for which the water available meets minimum response requirements.

6. Aircraft Firefighting and Rescue Vehicles. The type and quantity of crash/rescue vehicles assigned will vary with the operational status of the air activity. Assignments are made on the basis of the mission of the airfield and the actual number and types of aircraft. The number and types of crash/rescue vehicles assigned an activity are based on the minimum response requirements. More vehicles may be assigned to allow for repair and maintenance and for exceptionally hazardous and/or intense flight operations. The MB-1 and MB-5, using AFFF fire extinguishing agent, are the standard aircraft fire/rescue vehicles. In addition to the MB equipment, some selected air activities, which support aircraft with costly and intricate electronic equipment, have been provided a 06 carbon dioxide vehicle. This vehicle must be maintained as part of the standby alert and manned with minimum response requirements.

7. Support Crash/Rescue Vehicles. Supporting aircraft fire/rescue vehicles include the following:

a. Auxiliary aircraft fire/rescue trucks. These are small lightweight vehicles of the multidrive type and may be equipped with assorted power and hand-operated forcible entry tools and/or field lighting equipment. A truck-mounted TAU with the above equipment may be substituted for this support vehicle.

b. Water tankers/runway foamer. Runway foamer trucks may be assigned to or be on emergency call for service with the aircraft fire/rescue organization. Runway foamers may also be used to transfer water and/or fire extinguishing agent to other firefighters/crash rescue trucks, in the event such a transfer becomes necessary.

c. Structural fire pumpers and brush fire trucks. Structural fire pumpers and brush/structural fire trucks may be utilized to back up aircraft fire/rescue trucks. Particular benefits will be derived where installed water distribution systems, or sources of a static body of water are available with hose line relay distances. In addition to regular functions, brush/structural fire trucks should be used to respond to off-base aircraft emergencies.

d. Navy airlift type, dry chemical extinguisher, 400-pound capacity, Purple-K-Powder (P-K-P) extinguishers mounted on four-wheel drive, 3/4 to 1 ton pickup trucks equipped for crash/rescue operations.

NOTE: These units will be phased out and replaced as necessary with TAU's.

e. Crash ambulance. The medical officer is responsible to the commanding officer for the assignment of proper equipment and personnel for crash ambulances. Each ambulance on call for aircraft crashes should have equipment sufficient to provide adequate care for several injured persons. Crash ambulance crews should include at least one enlisted man, preferably a Corpsman trained in crash-rescue work and first aid, who also may act as the driver. At least one crash ambulance with crew should be ON STANDBY ALERT during scheduled flying hours and at such other times as designated by the commanding officer.

f. Aircraft salvage cranes. Mobile cranes (40- to 50-ton capacity) and truck-mounted (10- to 20-ton capacity) should be available to expedite aircraft salvage and/or rescue operations.

g. SAR (Search and Rescue), helicopters, and boats, where available.

8. Personnel Requirements.

a. Runway alert. The number of personnel assigned to MB-5 and TAU vehicles used on runway alert, as previously set forth in this chapter, is predicated upon those personnel required to drive and to operate the vehicle firefighting system, and simultaneously perform rescue functions.

b. Standby alert-immediate (3 Minute) availability. The following personnel are essential for immediate participation in emergency operations:

(1) Fire chief, as available, the on-duty assistant fire chief, and/or the aircraft fire captain on duty.

(2) Fire-rescue crews.

(3) Ambulance crew.

(4) Personnel for runway foamer.

(5) Aircraft SAR boat crew at those activities so situated so that availability of such boats is required.

(6) SAR helicopter crew (if available).

c. Support participation. The following personnel are required to provide support for aircraft fire/rescue and salvage operation:

(1) Aircraft maintenance personnel.

(2) Security personnel.

(3) Official photographic personnel.

d. Administrative participation. The following are required to be present at an accident site:

(1) Accident board members.

(2) Aviation safety officer.

(3) Such other personnel as the commanding officer deems necessary.

Manpower

It is essential that sufficient personnel be assigned to the aircraft firefighting/rescue organization to perform all assigned duties/functions. With exception of the runway alert vehicle (described previously), the following is established as the minimum number of on-duty personnel required for manning the standard fire/rescue vehicles:

MB-1	5 personnel
MB-5	4 personnel
Truck-mounted TAU	2 personnel
Nurse truck or combined foamer nurse truck	2 personnel
06 carbon dioxide truck (where provided)	2 personnel

The manpower criteria as directed by NavMat Instruction 11320.11, Aircraft Fire Fighting and Rescue Service, provides manning under the following specific conditions:

1. Continuous operations, with respect to hours of operations.
2. Normal operations, with regard to degree of hazard and intensity of flight operations.
3. With crews trained to fully utilize equipment/vehicle capabilities.

Some deviations from these specific conditions are to be expected. Commanding officers are enjoined to utilize the services of the area fire marshal and the station fire chief to establish an aircraft fire/rescue unit that realistically supports the station's mission.

HOURS OF OPERATION.—The majority of air activities are open to flight operations 24 hours a day, 7 days a week, and firefighters are employed on an average 72-hour workweek. A multiple factor of 2.7 men must be used to compute the number of personnel required to man a minimum response position 24 hours a day, 7 days per week. Some auxiliary landing fields, and outlying fields, are not operated 24 hours per day. As the hours of operation for which the fire/rescue function must be provided decreases from the 24-hour day to an 8-hour day, 40-hour week, the multiple factor decreases to 2.35 for a 65-hour week, to 1.65 for a 50-hour week, and to 1.1 for a 40-hour week.

NOTE: Multiple factors cited apply only to personnel required to man aircraft fire/rescue vehicles necessary to meet minimum response requirements.

One aircraft fire captain (supervisor) for each section is required in addition to the above listed personnel. If other duties such as maintenance and operation of arresting gear or FLOLS, wheel watches, salvage crane operation, mess cooking, or compartment cleaning are assigned to the fire organization, additional personnel must be assigned in consonance with the requirements for such other duties.

EXTRA-HAZARDOUS FLIGHT OPERATIONS.—Extra-hazardous flight operations, are those other than routine flight operations which, for reasons of training, intensity, and/or number of aircraft involved, increases the frequency of aircraft accidents. Examples of extra-hazardous flight operations are: any portion of the progressive phases of flight training where instructors are not available to the student, field carrier landings, combined squadron and/or airwing flight operations, aircraft with hospital litter cases aboard, aircraft involved in test and/or evaluation, and remotely controlled aircraft flight operations.

INTENSITY OF FLIGHT OPERATIONS.—The intensity of flight operations varies at air activities to well over 100,000 flight operations per quarter (fiscal). As the intensity of flight operations increases, the base loading of aircraft is increased. This imposes greater requirements for flight line fire prevention and protection efforts and increases the demands on the aircraft fire/rescue organization. The foregoing may dictate to the supervisor the necessity of increased manning levels.

ASSIGNMENT OF PERSONNEL.—Care must be exercised in assigning military personnel to aircraft fire/rescue duties. These men should be in good physical condition, be resolute, and possess initiative and a capability to assess a fire situation. The following standards meet the above criteria:

1. Driver/operators of emergency aircraft fire/rescue equipment must be 21 years of age or older. However, this requirement will be waivered down to 19 years of age for qualified graduates of the Aviation Crash Crew School, NATTC, NAS Memphis, Millington, Tennessee, or the Aviation Boatswain's Mate H (Aircraft Handling) Course, NAS, Lakehurst, New Jersey, provided that emergency fire/rescue equipment driver training requirements set forth by NavFac Instruction 11240.82 (Series), Policy and Procedures for the Testing and Licensing of Motor Vehicles, have been met.
2. Education—a minimum of 2 years of high school education.
3. Size—at least 5 feet 8 inches in height and weight of at least 135 pounds, well proportioned, and better than average strength and agility are essential.
4. Assignments should be for a 2-year period with a well-planned program for replacements in order to preclude sudden transfers of large numbers of experienced personnel. At least one-half of the on-duty personnel should have a minimum of 8 months' experience in the assignments.

AIRCRAFT CRASHES

Many variables are involved in aircraft emergencies that require immediate, positive, and accurate judgement with regard to response routes and firefighting tactics. As time is all important in effecting rescue of personnel, it is imperative that the responding crash firefighting vehicles be employed to effect the rescue as rapidly as possible. Once committed, time does not permit the redeployment of vehicles. The intensity of the operation and the full attention of personnel to combating fires and effecting rescue does not permit individual direction of personnel. In addition, the geographical location of the station, obstacles, terrain, and field layout differ for each activity.

Therefore, it is necessary that each aircraft crash firefighting organization preplan its actions so that all personnel are familiar with a basic plan of action. It must be remembered that preplanning is basic, and that conditions upon arrival at the scene may require adjustment to cope with the situation. The factors involved in preplanning and tactics employed at the scene are dependent upon the following:

1. Terrain.
2. Wind direction.
3. Type of aircraft involved.
4. Crew stations within the aircraft.
5. Fire location on the aircraft and/or degree of fire involvement.
6. Presence and type of ordnance stores.
7. Type of primary extinguishing agent dispensed by the responding vehicle(s).

When aircraft crash firefighting personnel respond to the scene of an emergency, they must have all information available to enable them to plan their attack intelligently and effectively. The aircraft control tower will transmit as much of the following information as is available:

1. Location of the aircraft emergency.
2. Type of aircraft.
3. Number of occupants.
4. Presence and type of ordnance aboard.
5. Fuel state, if known.
6. Any other amplifying information.

Speed is the essence of successful aircraft firefighting. A few seconds' difference may mean the saving of a life or the saving of an aircraft. Although the aircraft firefighter is highly trained and motivated toward speed of response and rescue of personnel, the speed of responding vehicles must be within the safety limitations of the vehicle. In short, the vehicle and rescue crew must arrive at the scene to accomplish their mission. The speed of the vehicles in response to an accident must be that at which the vehicle may respond and maneuver safely.

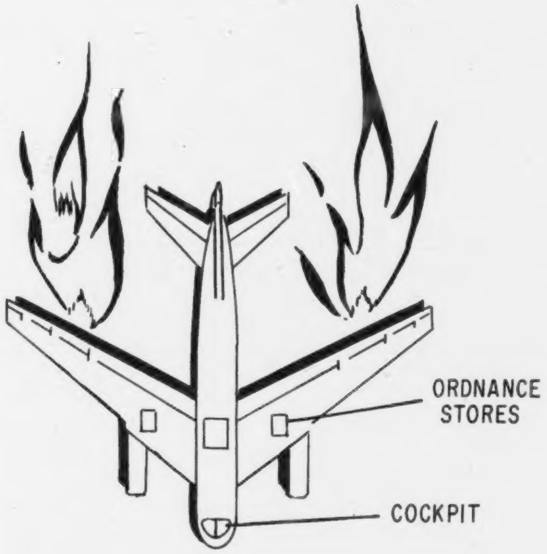
Normally the first aircraft crash/firefighting vehicle to arrive at the scene of an aircraft accident will be the runway alert vehicle. The responsibility for success of the rescue/firefighting operations rests heavily upon the first response vehicle. The driver-operator of the first response vehicle sets up the rescue/firefighting operation at the scene, and his decisions must be made accurately and on a split second basis. The first response vehicle sets up the initial path for the rescuemen and controls the fire in the control area. All other crash firefighting vehicles arriving at the scene must take position complementing the first response vehicle, enlarging on the pattern for rescue and total extinguishment. It must be borne in mind that all factors involved in aircraft crashes cannot be discussed in detail, as each accident will present many variables. The basic approach is that which will afford the most efficient control of fire in the area, or locations where rescue of personnel is to be performed. Due to prevailing conditions, these basic procedures may not be adaptable in their entirety, and may require deviations to accomplish the mission. The following paragraphs are points of consideration, not necessarily in their sequence of importance.

Type of Aircraft. The type and size of the initial fire control area will be dependent upon the type of aircraft, the number of personnel aboard, and their stations aboard the aircraft. Locations of access doors, hatches, and canopies must be considered, as well as obstacles and aircraft design features that may impede the rescue effort.

Basic Vehicle Spotting. The basic vehicle position, in relation to aircraft involved in an accident, is at the nose or tail of the aircraft. For aircraft in total fire involvement, this position affords the most advantageous location to provide coverage in the control area along both sides of the fuselage. (See fig. 4-1.)

Use the wind. The wind must always be used to your advantage, unless conditions dictate otherwise. Position vehicles and attack from upwind, with the wind to your back or on the quarter if possible. The seat of fire cannot be identified through smoke on the downwind side. When attacking a fire from the upwind approach, firefighting personnel are not subjected to the same intensity of heat as from a downwind approach. In addition, fuel vapors will drift away on the wind, whether ignited or not. (See fig. 4-2.)

On combat aircraft carrying rockets, missiles, or other ordnance stores containing rocket motors, the basic vehicle's spotting position will have to be adjusted to keep from being in the line of fire or exhaust blast areas in case the rocket motors are set off by heat from the fire. In this case the attack would be from the quarters, with attention directed toward expanding the control area to encompass rockets, missiles, or other ordnance stores containing rocket motors located in or on the



Note:

Control the area encompassing personnel locations and, if involved, ordnance stores stations. In the case of guns, rockets or missiles adjust to remain clear of the line of fire.

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Figure 4-1.—Fire control area.

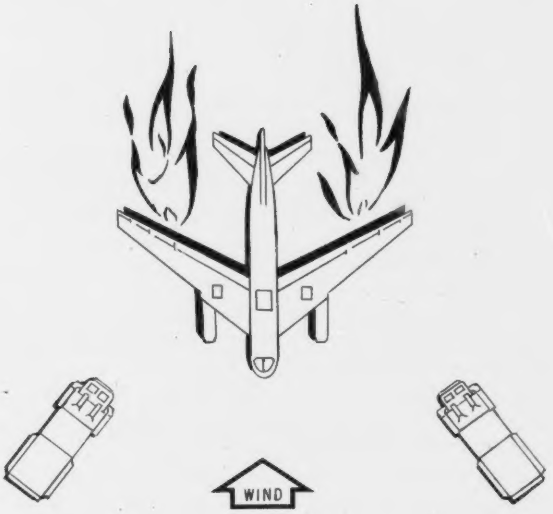

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Figure 4-2.—Use of wind direction to best advantage.

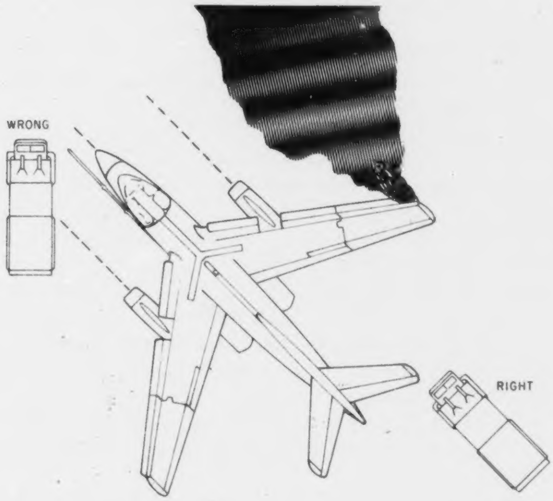

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Figure 4-3.—Beware of ordnance stores.

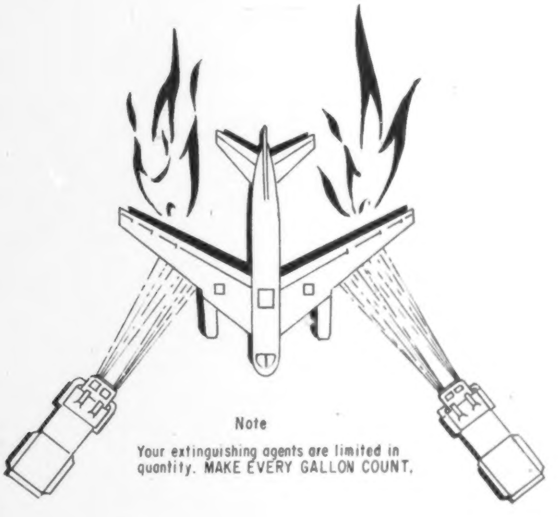
aircraft, as well as entrapped aircrew locations. In combating a fire on aircraft with ordnance stores that do not contain rocket motors, the initial attack should include, in the control area, the location of ordnance stores on the aircraft. When fixed guns are contained in the aircraft, the basic nose or tail spotting position will require adjustment to preclude vehicles or personnel from being in a direct line of fire from this type of weapon. (See fig. 4-3.)

Seat of Fire. The fire should be attacked to prevent spread, and to drive the fire outward from the aircraft or in a direction least hazardous to aircraft and crew. The fire is not to be driven toward the fuselage or ordnance stores locations. Plan your attack for control and extinguishment; and in your line of attack, do not oppose one another (more than one fire and rescue vehicle). Know the terrain surrounding the airfield; and in response, choose the ground that affords assurance of your arrival on the scene.

Get Into Range. Firefighting vehicles must be in effective range, with sufficient additional handline length for maneuvering. Position the vehicle to afford all firefighting appliances their maximum capabilities. (See fig. 4-4.) Liquid fuels or vapors flow with ground slopes, and may flow toward the crash/rescue vehicle if on a lower elevation than the source. Stay uphill, even though the elevation may be on the edge of a slight depression. (See fig. 4-5.)

In the event that it becomes necessary to move crash/rescue vehicles during firefighting operations, each vehicle should be positioned to permit movement in at least one direction. Support equipment must not be allowed to be positioned whereby movement of the crash firefighting vehicles is prevented.

Rescue. All aircraft crash/rescue vehicles and personnel must cover rescuemen during the entirety of the rescue operation. Even though total extinguishment may have been accomplished, vehicles and personnel hold their positions for instantaneous action in the event of reignition. Rescuemen face aft, keeping eyes on ejection seat and ejection seat controls while lifting injured or unconscious personnel out of attack or fighter aircraft. NOTE: Crew entrapment is discussed in a later section of this chapter.



Note

Your extinguishing agents are limited in quantity. MAKE EVERY GALLON COUNT.

AB.592

Figure 4-4.—Get into fire range.

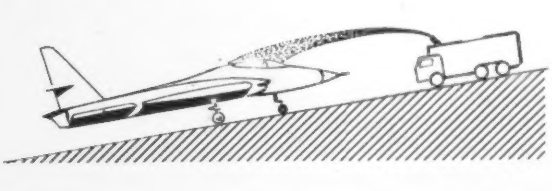


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Figure 4-5.—Attack fire from uphill vantage.

Attack

The attack on the fire commences as soon as the vehicles are within range of the fire, and as close to the aircraft as safely as possible. On MB type vehicles, the turret operators are in firefighting position well in advance of arrival to the scene if the accident occurs in the vicinity of the runways. Turret operators adjust the turret from straight stream to spray patterns, depending upon reach required and pattern desired, and using as much spray as possible to cover a large area. Sweeping the turret from side to side contributes to coverage of a large area in a short period of time.

The main objective is to knock down the mass of fire in the vicinity of the fuselage (fire control area) to permit immediate rescue; then concentrate on working the remaining fire areas over by appropriate pattern adjustment. The turret nozzlemen will be directed to shut off the turrets when the fire has been checked in the control area, and will keep one hand on the shutoff valve and the other hand on the turret handle in readiness for instantaneous action. Handlines will be utilized to extinguish small fringe and/or patch fires that may exist after turret shutdown.

The boom and ground-sweep nozzles of the 06 type aircraft crash/rescue vehicle are activated when in effective range of the fire, with the boom directed toward the fuselage of the aircraft and the ground-sweep nozzles covering the area in front of the vehicle. The CO_2 is dispensed until the fire is extinguished, and handlines are utilized for extinguishment and standby to combat reignition. CO_2 being a gas, is dispersed into the atmosphere and is carried from the fire area by the wind and, therefore, does not possess the capability of preventing backflash. It is imperative that personnel be extremely alert and be prepared immediately to combat backflash. When available, use foam to cover the fire area to prevent the possibility of a backflash (reignition).

The vehicle-mounted twinned agent unit (TAU) provides Purple-K-Powder dry chemical for quick extinguishment of aircraft fuel fires and the application of light water to blanket or cover the fuel, preventing backflashes. The vehicle approaches from upwind, and is positioned approximately 40 feet from the fire. The vehicle is so positioned to facilitate pulling nozzles and hoses from the side. Avoid possible kinks in the hose. The nozzleman advances toward the seat of the fire, directing P-K-P at the base of the fire. When headway on the fire is gained, the nozzleman advances, making a rescue path by sweeping from left to right, with both P-K-P and light water nozzles operating. When sweeping from left to right, the light water nozzle is off, and as the sweeping changes from right to left, both nozzles are activated. The fast action of the P-K-P and the excellent holding qualities of light water will allow the nozzleman to advance rapidly and open a path for the rescueman/men to accomplish the rescue. After the rescue path has been opened, the nozzleman continues to extinguish fire that might hinder rescue or, if rescue has been accomplished, he continues toward total extinguishment. A trained and experienced nozzleman can extinguish, and hold 2,400 square feet of fire area.

Reports and Grid Map

Within 72 hours following an aircraft emergency, the activity to which the crash/rescue organization is attached will submit a report of the incident on NavWeps Form 11135/1. (See fig. 4-6.) Reportable emergencies are those in which the crash/rescue performed rescue, firefighting, or salvage operations. It is imperative that the report be a complete and accurate description of the incident, including conditions, difficulties, and action taken. Of particular importance is information regarding the usage and performance of extinguishing agents and equipment. It is from these reports that the Naval Air Systems Command can determine program effectiveness and evaluate agent and equipment performance. Accurate reporting is a vital aspect to the crash/rescue program.

Report Routing.—The original of the report should be forwarded to the Commander, Naval Air Systems Command (Code 423) via the military command. One copy is included as an enclosure to the Aircraft Accident Report, as required by OPNAVINST 3750.6 (Series). This report is sent to CNO via NAVSAFECEN. One copy of the report will be provided for the appropriate district or area fire marshall who is assigned to conduct the annual crash rescue inspection. These inspections are documented on NavAer Form 2530. Additionally, and as the occasion requires, technical assistance concerning structural and crash/rescue programs and related subjects may be obtained from the district or area fire marshal.

DAILY LOG.—A daily log or journal must be maintained by each crash/rescue organization. Entries should include all alerts, responses, and other movements of crash/rescue equipment and/or crews, and such other information as would provide a day-to-day history of crash/rescue business. The fire chief will review and analyze the journal monthly for the purpose of determining adequacy of administrative and operational procedures.

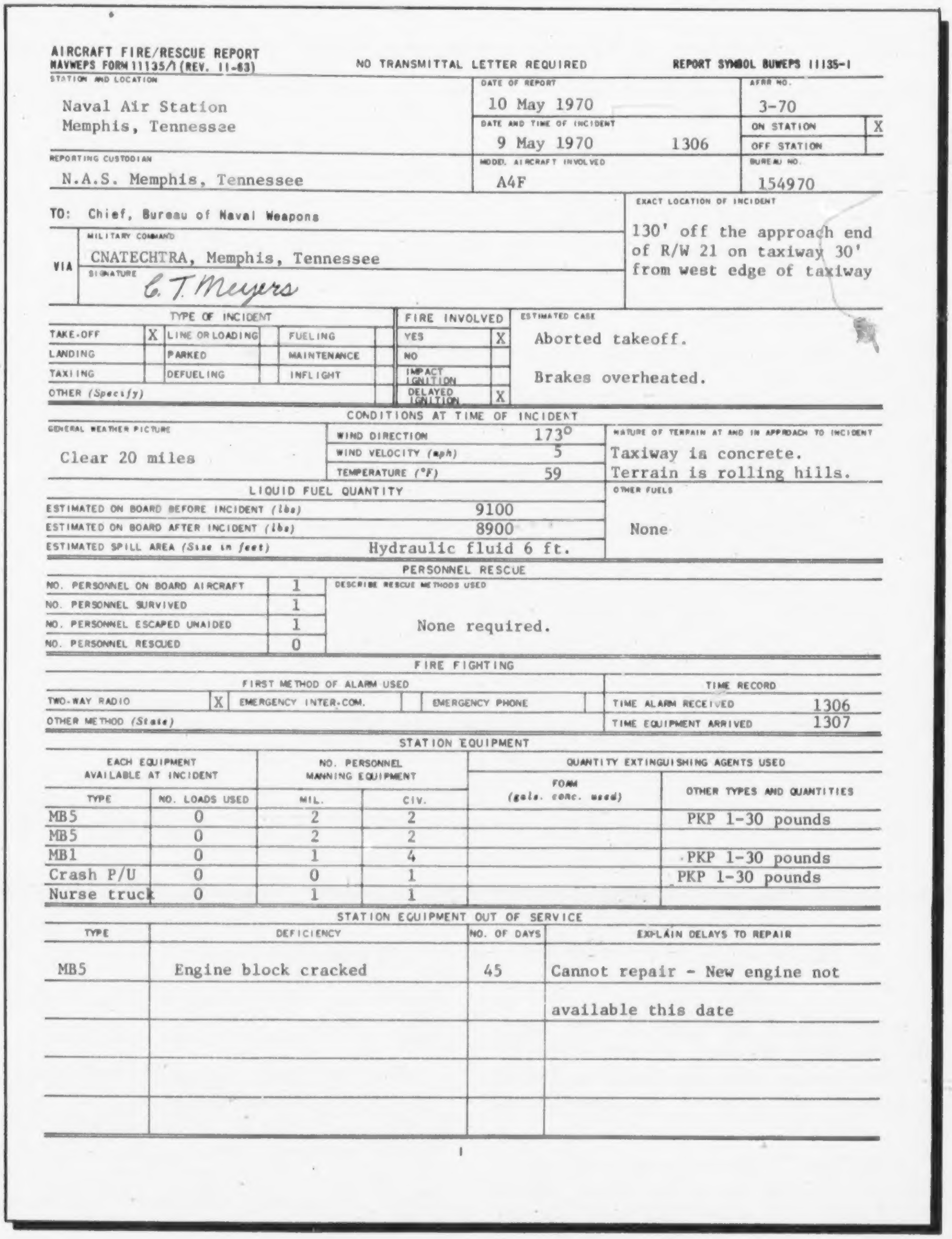
GRID MAP.—A system for locating and reaching an off-the-station crash in a minimum time, with as much crash fire rescue and medical equipment as circumstances warrant, must be employed at each airfield.

A map of the station and surrounding area of approximately a 15-mile radius (the 15-mile radius referred to herein is considered an optimum approximate distance and may be modified to conform to level conditions and terrain) must be maintained at the operations office, air traffic control tower, crash fire and fire stations, hospital, and security office. These maps should be ruled off in numbered grids and marked for easy location of any point within the map area. Figure 4-7 illustrates a grid map. Compass headings from the fields should be ruled on the map to facilitate locations of crashes by aircraft. Copies of this map must be kept in all vehicles and liaison aircraft that may be sent off the field in the event of a crash. Such maps should be coordinated between all airfield activities in the general area.

All aircraft crash firefighting and crash and hospital ambulance personnel should acquaint themselves as far as possible with terrain surrounding the airfield. Through personal inspection, they must know location of roads, bridges, paths, and other terrain features in a 15-mile radius of the field.

EMERGENCY AIRCRAFT FIREFIGHTING AND RESCUE TRUCKS

Crash-rescue crews, with equipment, must be maintained on an absolute alert and be in constant readiness for immediate response and



AIRCRAFT FIRE/RESCUE REPORT
NAVWEPS FORM 11135/1 (REV. 11-63)

NO TRANSMITTAL LETTER REQUIRED

REPORT SYMBOL BUWEPS 11135-1

STATION AND LOCATION: Naval Air Station
Memphis, Tennessee
DATE OF REPORT: 10 May 1970
AFRR NO.: 3-70
DATE AND TIME OF INCIDENT: 9 May 1970 1306
ON STATION ☒
OFF STATION ☐
REPORTING CUSTODIAN: N.A.S. Memphis, Tennessee
MODEL AIRCRAFT INVOLVED: A4F
BUREAU NO.: 154970
TO: Chief, Bureau of Naval Weapons
VIA MILITARY COMMAND: CNATECHTRA, Memphis, Tennessee
SIGNATURE: C. T. Meyers
EXACT LOCATION OF INCIDENT: 130' off the approach end of R/W 21 on taxiway 30' from west edge of taxiway

TYPE OF INCIDENT						FIRE INVOLVED	
TAKE-OFF	X	LINE OR LOADING		FUELING		YES	X
LANDING		PARKED		MAINTENANCE		NO	
TAXIING		DEFUELING		INFLIGHT		IMPACT IGNITION	
OTHER *(Specify)*						DELAYED IGNITION	X

ESTIMATED CASE: Aborted takeoff.

Brakes overheated.

CONDITIONS AT TIME OF INCIDENT

GENERAL WEATHER PICTURE: Clear 20 miles
WIND DIRECTION: 173°
WIND VELOCITY *(mph)*: 5
TEMPERATURE *(°F)*: 59
NATURE OF TERRAIN AT AND IN APPROACH TO INCIDENT: Taxiway is concrete. Terrain is rolling hills.

LIQUID FUEL QUANTITY

ESTIMATED ON BOARD BEFORE INCIDENT *(lbs)*: 9100
ESTIMATED ON BOARD AFTER INCIDENT *(lbs)*: 8900
ESTIMATED SPILL AREA *(Size in feet)*: Hydraulic fluid 6 ft.
OTHER FUELS: None

PERSONNEL RESCUE

NO. PERSONNEL ON BOARD AIRCRAFT: 1
NO. PERSONNEL SURVIVED: 1
NO. PERSONNEL ESCAPED UNAIDED: 1
NO. PERSONNEL RESCUED: 0
DESCRIBE RESCUE METHODS USED: None required.

FIRE FIGHTING

FIRST METHOD OF ALARM USED: TWO-WAY RADIO ☒ EMERGENCY INTER-COM. ☐ EMERGENCY PHONE ☐
OTHER METHOD *(State)*:
TIME RECORD
TIME ALARM RECEIVED: 1306
TIME EQUIPMENT ARRIVED: 1307

STATION EQUIPMENT

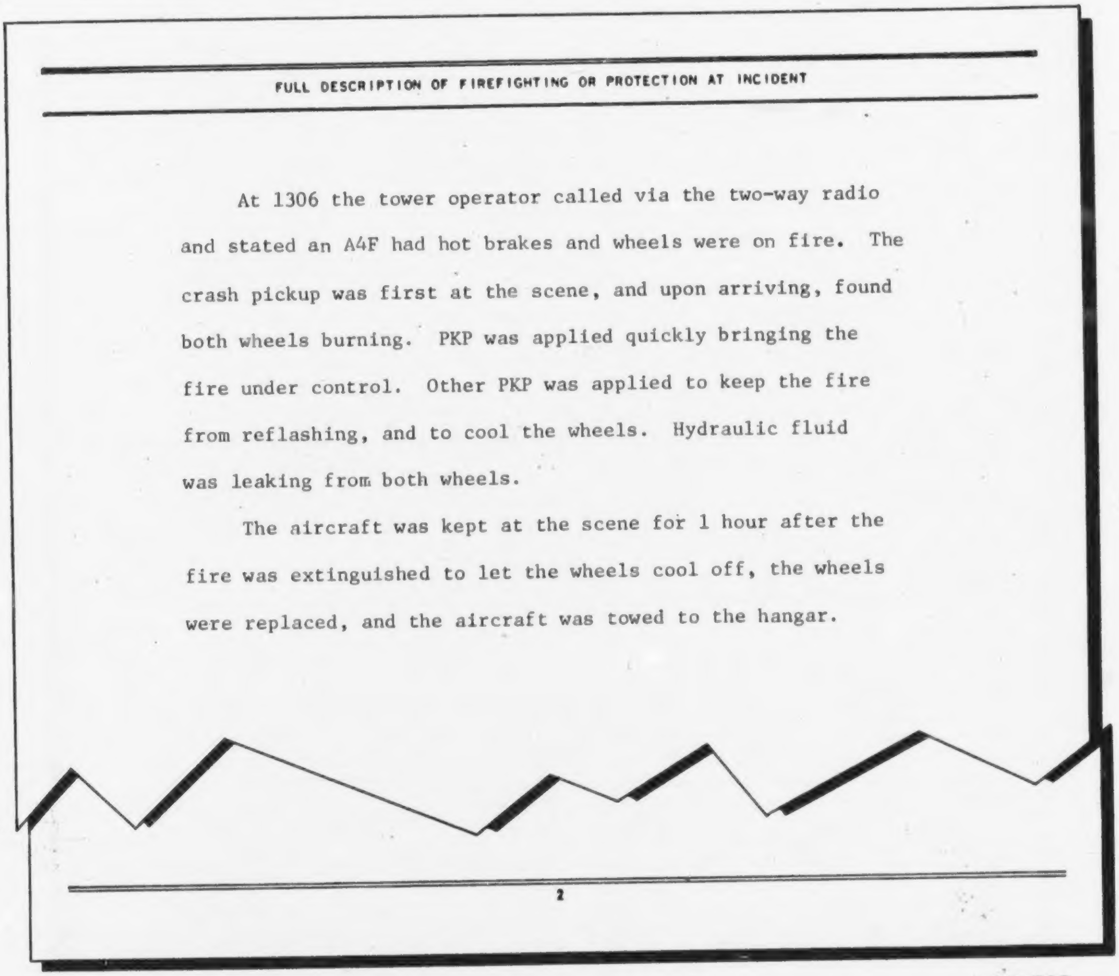
EACH EQUIPMENT AVAILABLE AT INCIDENT		NO. PERSONNEL MANNING EQUIPMENT		QUANTITY EXTINGUISHING AGENTS USED	
TYPE	NO. LOADS USED	MIL.	CIV.	FOAM *(gals. conc. used)*	OTHER TYPES AND QUANTITIES
MB5	0	2	2		PKP 1-30 pounds
MB5	0	2	2		
MB1	0	1	4		PKP 1-30 pounds
Crash P/U	0	0	1		PKP 1-30 pounds
Nurse truck	0	1	1		

STATION EQUIPMENT OUT OF SERVICE

TYPE	DEFICIENCY	NO. OF DAYS	EXPLAIN DELAYS TO REPAIR
MB5	Engine block cracked	45	Cannot repair - New engine not available this date

AB.594

Figure 4-6.—(A) Aircraft Fire and Rescue Report form.



FULL DESCRIPTION OF FIREFIGHTING OR PROTECTION AT INCIDENT

At 1306 the tower operator called via the two-way radio and stated an A4F had hot brakes and wheels were on fire. The crash pickup was first at the scene, and upon arriving, found both wheels burning. PKP was applied quickly bringing the fire under control. Other PKP was applied to keep the fire from reflashing, and to cool the wheels. Hydraulic fluid was leaking from both wheels.

The aircraft was kept at the scene for 1 hour after the fire was extinguished to let the wheels cool off, the wheels were replaced, and the aircraft was towed to the hangar.

2

AB.595

Figure 4-6.—(B) Aircraft Fire and Rescue Report form—Continued.

action. Costly errors in material and lives have been and will continue to be made by personnel underestimating or overestimating potential and capabilities of personnel and equipment.

In order for the crash-rescue crewman to make a correct evaluation of any crash situation, he must first have a working knowledge of all equipment available to the crash-rescue crew.

Crash-rescue equipment is uniformly distributed throughout the Navy according to its mission and support requirements.

MB-1 Trucks

The Navy's MB-1 aircraft firefighting and rescue trucks are its largest and most potent pieces of apparatus. They are designed to move rapidly to the scene of a fire in a hurry, thus saving lives and property. The two types of MB-1 trucks are described in the following paragraphs.

The Biedeman and Marmon-Herrington (older type vehicles) are mounted on a 6 x 6 chassis, powered by a 320-hp engine. (See fig. 4-8.) The gross weight is approximately 36,000 pounds consisting of 1,000 gallons of water and

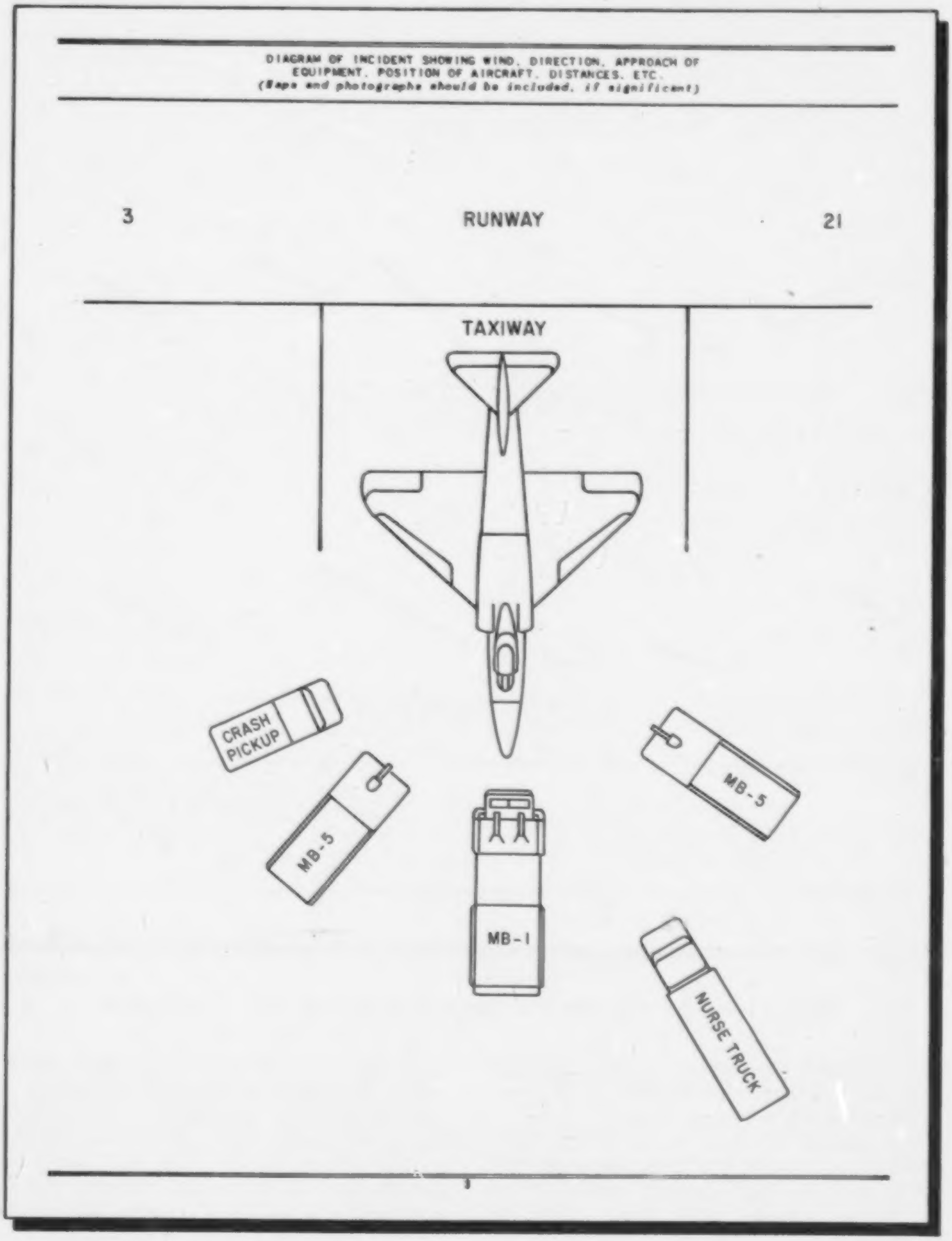
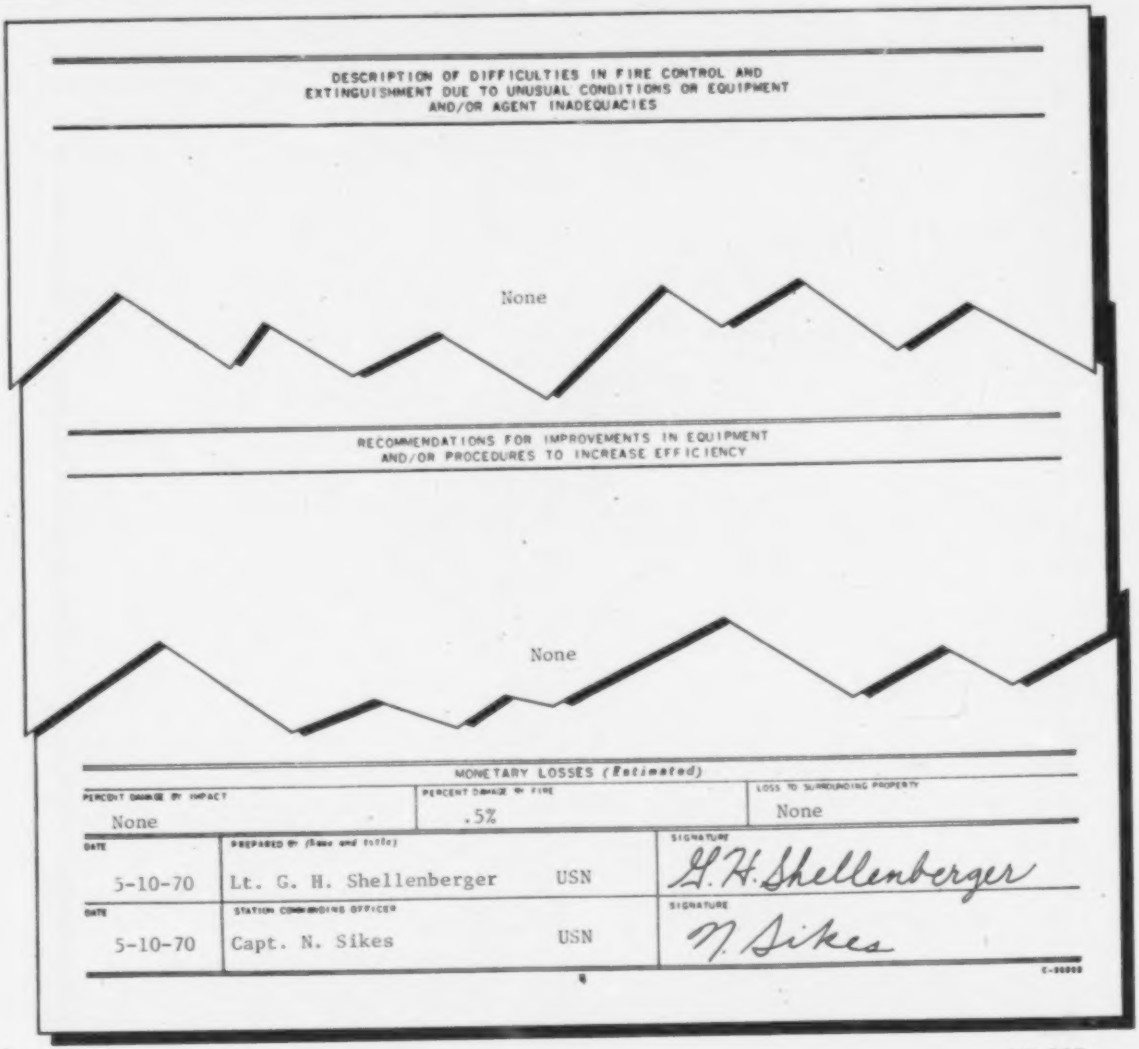


DIAGRAM OF INCIDENT SHOWING WIND, DIRECTION, APPROACH OF
EQUIPMENT, POSITION OF AIRCRAFT, DISTANCES, ETC.
(Maps and photographs should be included, if significant)

3
RUNWAY
21
TAXIWAY
CRASH PICKUP
MB-5
MB-1
MB-5
NURSE TRUCK

AB.596

Figure 4-6.—(C) Aircraft Fire and Rescue Report form—Continued.



DESCRIPTION OF DIFFICULTIES IN FIRE CONTROL AND EXTINGUISHMENT DUE TO UNUSUAL CONDITIONS OR EQUIPMENT AND/OR AGENT INADEQUACIES

None

RECOMMENDATIONS FOR IMPROVEMENTS IN EQUIPMENT AND/OR PROCEDURES TO INCREASE EFFICIENCY

None

MONETARY LOSSES (*Estimated*)

PERCENT DAMAGE BY IMPACT	PERCENT DAMAGE BY FIRE	LOSS TO SURROUNDING PROPERTY
None	.5%	None

DATE	PREPARED BY (Name and title)	SIGNATURE
5-10-70	Lt. G. H. Shellenberger USN	G. H. Shellenberger
DATE	**STATION COMMANDING OFFICER**	**SIGNATURE**
5-10-70	Capt. N. Sikes USN	N. Sikes

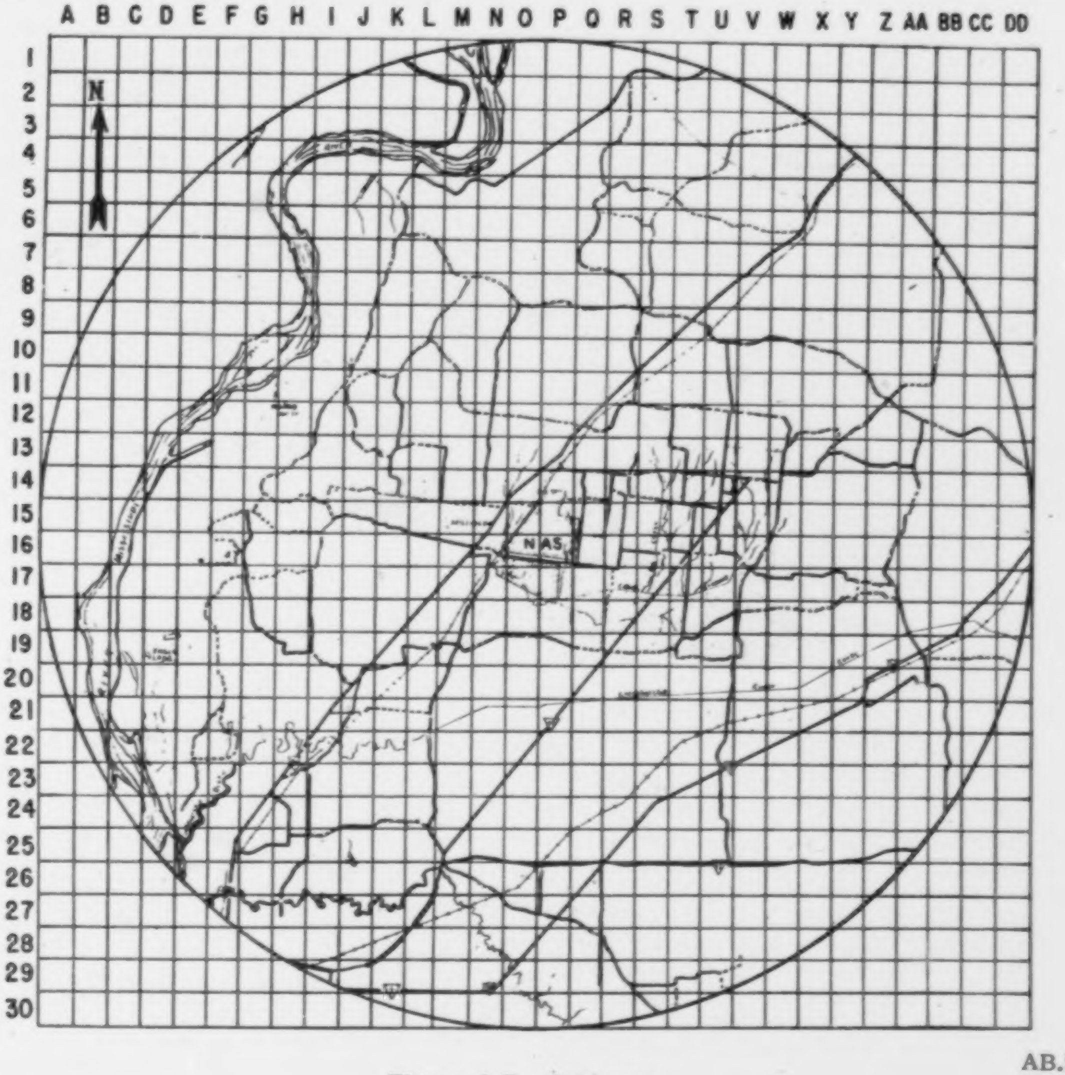
AB.597

Figure 4-6.—(D) Aircraft Fire and Rescue Report form—Continued.

65 gallons of foam concentrate. This type of truck can reach a speed of 45 mph in 33 seconds and obtain a top speed of 64 mph.

The big feature of this truck is its twin independent foam making systems, each generating 3,000 gpm of high quality mixed foam solution. When properly used, it can cover an aircraft fuselage with an insulating layer of foam and extinguish tremendous areas of aircraft fuel spillage fire. Each of the two identical systems is powered by a 112-hp gasoline engine and completely independent. Both systems may be placed in operation when maximum discharge is needed, or either system may be operated separately. Each turret nozzle is therefore independent of the other.

The turret nozzles used with these separate pumps are of a special design. All foam is fully formed before it reaches the nozzle so it merely acts as a foam distributor. The foam maker pump adds the proper volume of air and discharges the foam forcibly through the turret on the top deck. Remote controls enable the turret operator to open and close valves from


A B C D E F G H I J K L M N O P Q R S T U V W X Y Z AA BB CC DD
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
N
NAS

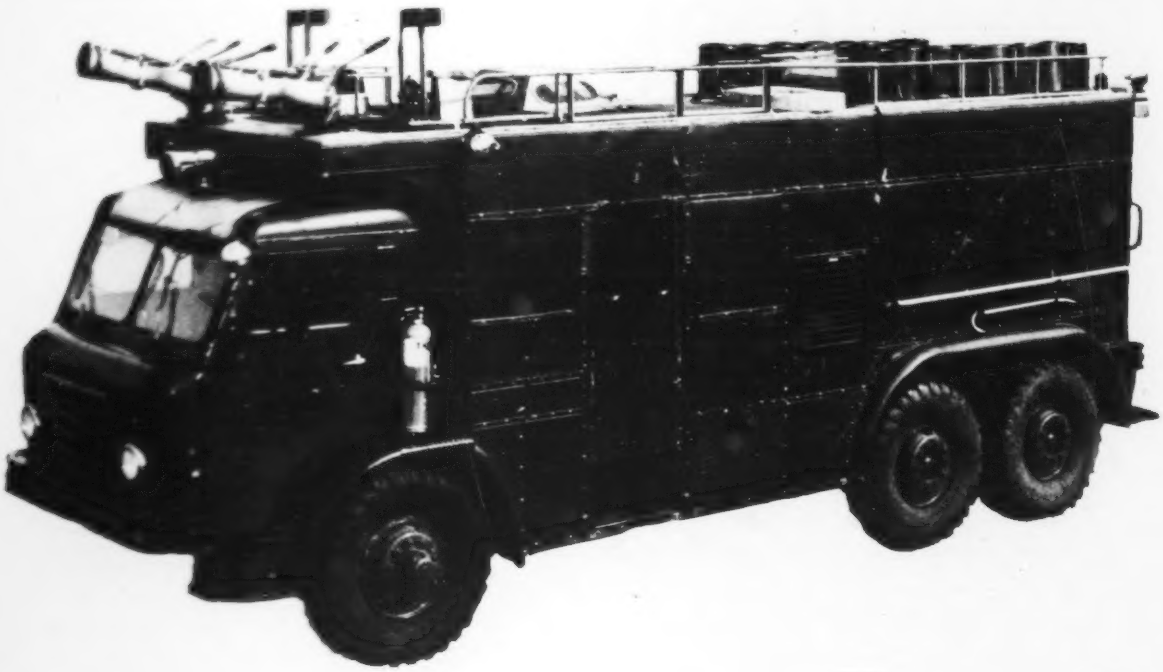
AB.598

Figure 4-7.—Grid map.

the turret position. The turrets may be rotated 360 degrees, elevated 70 degrees, or depressed 20 degrees.

A feature of the turret nozzles is their infinitely variable pattern adjustment, from a solid stream with a range up to 180 feet, to a wide dispersed pattern for close-in work. This feature enables the turret operator to focus constantly on the target with less maneuvering of the truck. Overhead sighting from the top deck enables the operator to place the foam where it will do the most good.

Foam flow is turned on and off by a convenient controller located in front of the turret operator. By means of remote air pressure control, the water and foam concentrate valves are opened and the pump engine throttle advanced to the proper speed. When foam is no



AB.599

Figure 4-8.—Aircraft crash firefighting and rescue vehicle (old type) MB-1.

longer needed, the controller is returned to the OFF position. An intermediate position produces a water-only turret discharge and is used when only water is needed to fight a fire and also for flushing purposes, after making foam.

There is a separate handling pump system in the MB-1 truck. This system supplies the handline nozzles and the undertruck nozzles with an effective firefighting foam. It is an independent system from the two large foam maker systems, and this auxiliary handline pump is controlled from the driver's seat. The handline nozzles do a good job of extinguishing smaller fires because they are flexible and easy to handle and are of use chiefly for mopup operations.

Both the main pump systems and the handline system require cleaning and flushing after each use. The foam concentrate will clog the system and corrode metal parts; therefore, the importance of thorough flushing after each use cannot be overstressed.

Auxiliary equipment carried on the MB-1 crash truck consists of the following items:

Gasoline heater for the engine compartment.

Four search-and-flood lights.

Siren and red light located over the cab.

Revolving red beacon located between the turrets.

Aircraft type power plug located on the rear of the truck.

A two-way radio.

An independent air-cooled gasoline-engine-driven generator provides electrical power for light, radio, etc., during all standby operations. It is not necessary to idle the truck engine for long periods for this purpose.

An extension ladder is conveniently attached outside the body on the starboard side and a pikepole and a door opener on the portside. Two portable extinguishers (CO_2) are mounted forward inside the bus doors. Inside the cab there is an air-charging hose that is used to keep the truck tires up to pressure. There are also racks located on the top of the truck to store spare 5-gallon foam cans. Located in each truck should be a standard rescue kit.

The driver is responsible for the truck, the crew, and the readiness of both at all times. The crew assignment for the MB-1 crash truck is as follows: one driver, two turretmen, and two rescuemen.

When proceeding to the scene of a crash, the turretmen and the rescuemen ride in the pump engine compartment. The turretmen start the pump engine and engage the clutches while the truck is underway. As a safety precaution, turretmen will not man the turrets until the truck nears the crash.

While definite inspection and/or service routines of the MB-1 truck may be assigned to a specific member of the crash fire department, it is desirable to insure that each member of the crash crew is instructed in the operation and function of all components of the apparatus.

A rigid inspection and preventive line maintenance procedure has been established which will provide maximum vehicle efficiency, prolong the operating life, and reduce periods of deadline.

All major maintenance and repair for the MB-1 crash truck is accomplished by the transportation division of the station's public works department.

The new Yankee-Walters MB-1 is mounted on a 4 x 4 chassis, is powered by a 300-hp, multifuel engine (Marine) or a 318-hp diesel engine (Navy), and is equipped with an automatic transmission. Gross weight is approximately 38,000 pounds. The tanks will carry 1,000 gallons of water and 130 gallons of agent concentrate. It can reach 50 mph in 32 seconds and attain a top speed of 65 mph. The feature of this truck is simplicity and ease of operation. It is equipped with a 6,000 gpm positive displacement rotary sliding vane type foam pump, powered by one engine; two 3,000-gpm turret nozzles (foam); two handline foam nozzles; and a 150-pound P-K-P dry chemical extinguisher. A 5-man cab with two turret access hatches is also a new feature.

MB-5 Trucks

The Navy older type MB-5 crash truck is a lightweight, high-performance vehicle mounted on a 4 x 4 chassis and powered by an 8-cylinder, rear mounted, gasoline engine. This truck is designed to carry auxiliary extinguishing agents and equipment as well as foam and water. It has a capacity of 400 gallons of water and 30 gallons of foam concentrate. The foam making components are the same as in the MB-1. A power takeoff drive arrangement is used on the turret foam system so the vehicle cannot move while pumping.

The features of this truck are a specially insulated body equipped with sliding type doors; hose reel, equipped with an interchangeable foam and water spray nozzle; a bayonet piercing nozzle; two-way radius searchlights and floodlights for night operations; and a separate gasoline auxiliary power unit to recharge batteries. Standard equipment provides three 30-pound Purple-K-Powder extinguishers for aviation fuel fire and wheel and/or tire fires, and one 50-pound carbon dioxide extinguisher. (See fig. 4-9.)

The following firefighting tools are included:

Adjustable hydrant wrenches and Halligan door openers or Hayward claw tools. These tools are mounted in the cab.

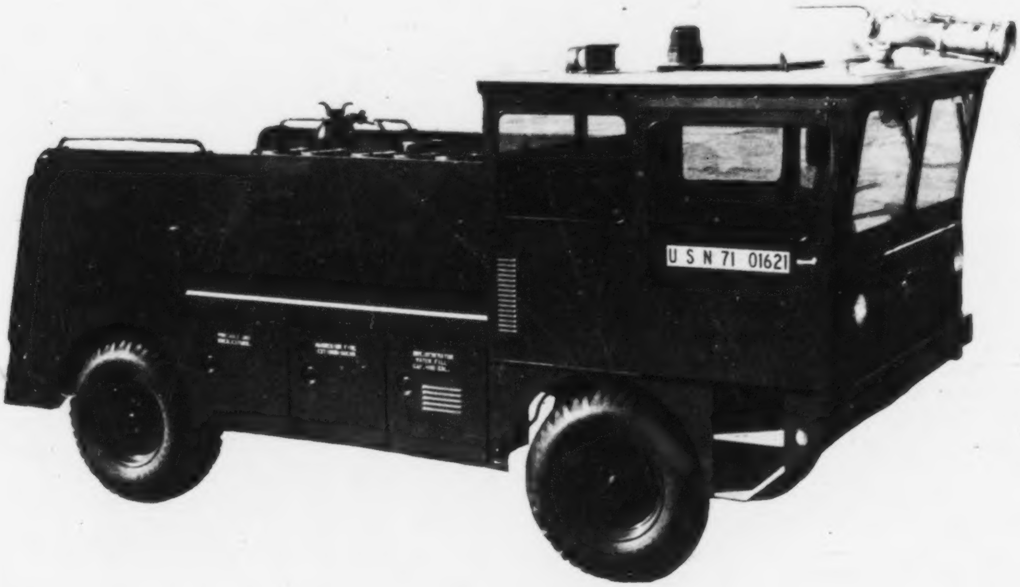
Metal cutting saw. This saw is intended for aircraft forcible entry and rescue purposes and is mounted in a closed compartment forward of the right rear wheel. Power for saw operation is provided by a 230-volt, 180-hertz, 3-phase generator, belt-driven from a power takeoff on the transfer case.

A 50-foot live cable reel is provided and is mounted in the saw compartment.

The foam pump-turret is the main output of the truck. It is exactly the same as one of the foam systems on the older type MB-1 trucks except that it does not have an independent engine drive.

Because of the nature of the pump drive train, it is necessary to have the driver engage the power takeoff after the vehicle has been properly positioned and stopped at the fire scene. Once this is done the turret operator has complete control of the turret output until such time as it may be necessary for the vehicle to move.

The turret is mounted on the cab roof and is operated by standing on the center seat with the roof hatch open. The construction and manipulation of the turret are the same as for the old type MB-1. A separate pumping system handles the handline nozzle. A centrifugal pump driven from a power takeoff supplies foam solution or water to the nozzle. The driver engages the power takeoff and opens the pump suction valves to start the system. He must set the hand throttle or control the foot throttle to maintain proper pressure. The pump being of the centrifugal type allows the handline operator to



AB.298

Figure 4-9.—Aircraft firefighting and rescue truck (old type) MB-5.

open and shut his nozzle without concern to the pump speed.

The handline nozzle is stored in the hose reel compartment. It consists of a shutoff valve and three interchangeable discharge devices. One is a variable pattern foam making nozzle, the second is an adjustable water spray nozzle, and the third is a bayonet nozzle. All are fitted with a quick disconnect type joint to permit rapid change of attachments. The spray nozzle and bayonet nozzle are normally used with plain water. The valves used to set the system for water or foam solution must be operated from the driver's position in the vehicle cab. The bayonet nozzle is used to pierce the skin of the aircraft to cool the interior with a spray of water.

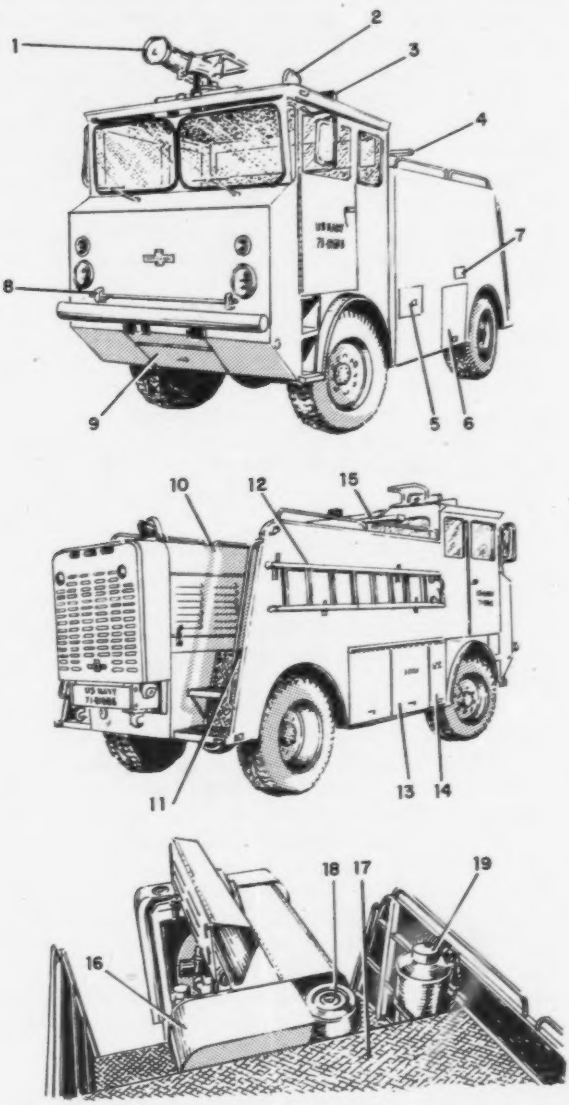
The water tank capacity is 400 gallons. It can be filled either through an opening on the top deck or through a valve on the curbside of the truck.

The foam concentrate tank capacity is 34 gallons, but is only filled to a working capacity of 30 gallons. The truck is filled with foam from the top deck by removing the round tank top cover and pouring in the foam slowly so as to prevent excessive frothing. A transparent plastic tubing inside the cab serves as a sight level gage. It should be cleaned frequently for accurate reading.

Just as with the MB-1 truck, the MB-5 truck pumping systems must be thoroughly flushed with water whenever the system has pumped foam.

A newer type of crash rescue vehicle which is the Oshkosh MB-5. This new Oshkosh MB-5 operates as a self-contained unit and does not require any accessories or material other than those it carries to perform its normal function. Various compartments and mounting facilities are provided for the storage and transport of the necessary firefighting and rescue equipment. (See fig. 4-10.)

This truck is a four-wheel drive vehicle, with a semiautomatic "power shift" transmission that provides four forward speeds, neutral, and reverse. Operator controls include power steering and power brakes to all four wheels. A normal complement of gages, and instruments,



AB.600

Figure 4-10.—Oshkosh MB-5 firefighting and rescue truck.

Nomenclature for figure 4-10.

1. Foam turret.
2. Spotlight.
3. Emergency beacon.
4. Foam tank vent.
5. Foam tank fill and drain valves and fuel filler access door.
6. Dry chemical system handline compartment door.
7. Nitrogen cylinder valve compartment.
8. Front handline bayonet applicator.
9. Front handline compartment door.
10. Main engine compartment.
11. Battery compartment.
12. Ladder hooks.
13. Fire extinguisher compartment.
14. Hydrant fill, water tank drain valve and tool compartment.
15. Water tank vent.
16. Auxiliary generator compartment.
17. Work deck.
18. Main engine air cleaner.
19. Dry chemical tank.

and switches for the operation of all accessories is provided on the dashboard instrument panel.

The gross weight is 20,000 pounds, and the truck will carry 420 gallons of water maximum; recommended fill, 400 gallons. The agent concentrate tank capacity is 34 gallons; recommended fill, 30 gallons. The agent concentrate and water tank is a fiberglass, compartmented tank located under the top deck of the vehicle, between the personnel cab and the engine. The tank is of one-piece construction with a removable cover. The foam tank is a separate compartment molded into the front roadside (port) of the water tank. The water tank is provided with molded-in baffles to minimize "sloshing" and the resultant rapid weight transfer. The tank cover is fitted with two separate hatches, or filling covers; one for water and one for agent concentrate.

The foam and water system is actually two separate systems—the turret supply and the handline supply. Although both systems are supplied by a common source, each has its own pump. Both systems will pump water only or an agent concentrate and water mixture. All controls are located in the personnel cab and are readily accessible to the driver and/or the turret operator. Unlike the older MB-5 trucks, the newer Oshkosh trucks may operate the turret and handline systems while the truck is moving.

NOTE: When the truck has reached the site of the fire, the operator must place the pumping governor switch in the "ON" position. This will immediately limit engine speed to 1,300 to

1,400 rpm. Due to an electrical interlock, the turret valves and the front handline valves cannot be opened until the pumping governor switch is "ON." Operation of the truck must be restricted to the use of first, second, and reverse gears only when the governor switch is "ON." The turret pump is a rotary vane type capable of 3,000 gpm, the same capacity as that of the turret.

The dry chemical system (P-K-P) consists of a 150-pound capacity canister and a nitrogen cylinder that is used to propel the P-K-P. The nitrogen cylinder and dry chemical canister are accessible from the roadside workdeck, and the system discharge is through a hose reel handline. The truck also carries three dry chemical (P-K-P) fire extinguishers of the portable type. They are mounted in a storage compartment on the curbside (starboard) of the vehicle.

Runway Foamer/Nurse Truck

The firefighting-agent carrying capacity of aircraft firefighting and rescue vehicles has always been severely limited because of the need for vehicle performance both in acceleration and off-highway operation. One common attempt at solving this problem has been the use of auxiliary trucks which have greater capacities and which serve to replenish the faster, first-response vehicles at the scene of a fire. The nature of this operation has led to the popular name of "nurse" truck.

Runway foaming vehicles and auxiliary tank vehicles have two important features in common: the carrying of copious amounts of water and foam concentrate and a means of pumping both at high flow rates. These features make it possible and desirable to combine them both into one vehicle as both functions are not required simultaneously.

Usually, a refueler truck is converted to combine the functions of foaming runways and serving as a "nurse" truck to resupply water and foam concentrate to aircraft firefighting vehicles.

The vehicle should be capable of carrying at least 3,000 gallons of water and 200 gallons of foam concentrate. This is equivalent to three loads of the largest primary vehicle—the MB—and can provide the MB-1 with 8 minutes of continuous foam application at a rate of 6,000 gpm or a total of 48,000 gallons of expansion 12 foam. Of course, it is necessary that the nurse truck be capable of transferring both liquids in excess of the output rate of the MB-1, which is 530-gpm water and 30-gpm foam concentrate. Allowing some time for delayed arrival and making the necessary hose connections, the nurse vehicle should have a minimum output of 600 gpm of water at 15 psi and 45 gpm of foam concentrate.

NOTE: Light water foam is not satisfactory for runway foaming; protein type foam must be used for runway foaming.

A minimum pumping rate of 600 gpm at 100 psi will also expedite runway foaming operations, as rate of area coverage depends directly on the rate of water discharge and foam production. On the basis of 0.1 gallon of water per square foot required to cover the runway surface adequately, a total of 30,000 square feet can be covered by one load of 3,000 gallons of water in 5 minutes.

Time and circumstances permitting, an airfield runway may be foamed in preparation for the landing of an aircraft experiencing landing gear malfunction. The intent is to minimize the fire hazard by the suppression of friction-generated metal sparks.

Information concerning an anticipated foaming is communicated via the crash circuit by the operations duty officer or the control tower immediately to provide the crash crew with maximum time possible.

The operations duty officer, after conferring with the crash captain, determines the feasibility of providing the requested runway foam based on the availability of crash equipment, prevailing weather conditions, and the time required for its application. He then notifies the crash captain immediately when runway foam is to be used and gives the following information:

1. Time aircraft can remain airborne.
2. Type. Foam pattern #1—all gear up, indicating belly landing. Foam pattern #2—foam at arresting gear, indicating partial gear down. Give particulars on which gear is down so swerve direction can be estimated.
3. Designate runway to be foamed.

Plans for foaming a runway should never include use of the primary aircraft firefighting and rescue vehicles. Full firefighting capabilities for use after the aircraft has touched down must not be compromised in any way. The flight plans of an aircraft under emergency conditions are usually subject to sudden change and this may lead to being caught with empty or partially filled vehicles should the plane come in ahead of schedule. Therefore, only vehicles over and above the normal required complement should be used for runway foaming.

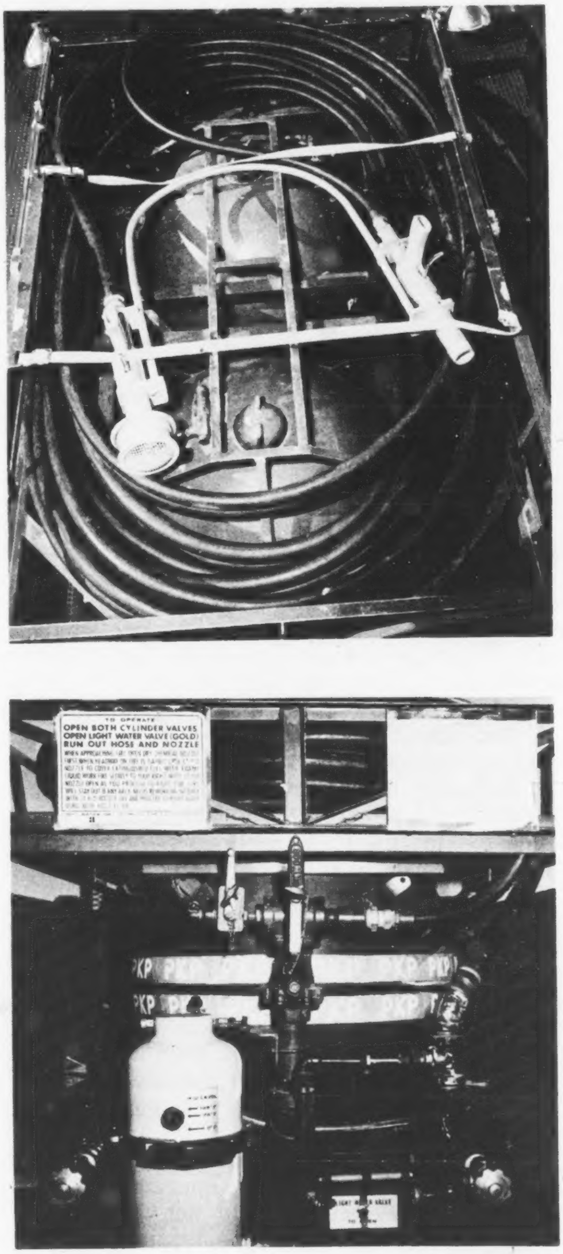
During foaming operations, continuous radio contact should be maintained between the foaming crew and the aircraft. A change in the pilot's status may cause him to come in sooner than expected, or it might be necessary to break off the foaming to reload the trucks. Orbiting the aircraft to achieve a low fuel state will materially lower the fire hazard.

Truck-Mounted TAU

This unit combines the quick flame knockdown capability of P-K-P with the vapor-securing and blanketing ability of light water, providing a rapid and lasting flame extinguishment. Therefore, this unit provides a means of effecting rapid rescue of personnel from burning aircraft.

The TAU is a self-contained, skid mounted, fire extinguishing system, consisting of two 28-inch-diameter aluminum spherical tanks, one containing 400 pounds of P-K-P and the other containing 48.5 gallons of light water solution. The contents of the two spherical tanks are discharged by pressure from two cylinders of high-pressure nitrogen. A third cylindrical tank contains refrigerant gas which automatically introduces gas-vapor into the light water solution at the foam nozzle, providing for foam generation and stabilization. A 100-foot dual hose line supplies the two fire extinguishing agents to the single firefighter's dual nozzle holder. Pistol grip trigger valves control the flow of each extinguishing agent. These units are designed for mounting on crash-rescue trucks (Dodge Power Wagon, 4 x 4) and as such will replace the Navy airlift type, 400-pound dry chemical extinguisher, mounted thereon. (See fig. 4-11.)

This light water-dry chemical fire extinguisher is an efficient extinguisher of class B flammable fuel fires and mixed class A and B fires. The 800 pounds of extinguishing agents contained in the TAU will extinguish 2,500 square feet of JP-4 fuel. The light water foam used singly provides an excellent vaporproof coating for unignited flammable fuel spills. The TAU will fully extinguish and fireproof a circular fire area, containing obstacles, of about 50 feet in diameter. A rescue path may



AB.301

Figure 4-11.—Truck-mounted twinned agent unit (TAU).

be made into larger fires with the equipment, and personnel may be rescued in complete safety from fuel reflash although fires may exist at the sides of the path. This unit, mounted on the required crash-rescue truck, can be used on runway and standby alerts where an MB-5 is ordinarily used.

The Purple-K-Powder dry chemical used provides for quick knockout of fires. The application of the light water to extinguished fuel prevents backflash of fire. Operation of the fire extinguisher must be performed smoothly and skillfully since available continuous discharge time is 1 minute for the light water and 2 minutes for the dry chemical.

The twinned light water-dry chemical fire extinguisher is equipped with twinned hose and trigger-operated twinned nozzles, each having its own shutoff valves, and may be operated independently or simultaneously. (See fig. 4-11.)

In the event of a fire, position the extinguisher to within approximately 50 feet from the fire and upwind if possible. Open both nitrogen cylinder valves. Pull the ring pin and open the light water valve, then release the hose and nozzle holddown and pull the twin hose and nozzle assembly from the hose basket, allowing the hose to twist freely. Hand the nozzle to the firefighter. (See fig. 4-12.)

Approach the fire from upwind; open the dry chemical nozzle first. Direct the dry chemical at the base of the flames covering the entire width of the fire or rescue path at first with a side-to-side sweeping motion. When headway is gained on the fire, open the light water nozzle to cover extinguished fuel with foamy liquid. Work the fire slowly to your right with both nozzles open as you proceed to the right side. Fire will stay out. If any area needs reworking, go back with the light water nozzle off and proceed to the right, again using both nozzles on. After light water has been used, rapid side-to-side sweeping will not be necessary.

After the fire has been extinguished or a rescue path has been secured, close nozzles and standby to assure no additional fire occurs and/or to protect the rescue operators.

Purple-K-Powder should not be directed into the intake or used in the accessory section of jet engines until other attempts have failed to extinguish the fire. The fine grain powder will penetrate minute crevices and leave a residue which, if ingested into a jet engine, will penalize engine performance and restrict internal cooling air passages thereby requiring disassembly of the engine to remove deposits. Purple-K-Powder that has penetrated small crevices in and around the accessory section and has been exposed to moisture is very difficult to remove completely and eventually will cause corrosion. Therefore, Purple-K-Powder should not be used on internal and accessory section jet engine fires and electrical equipment fires until it is apparent that carbon dioxide extinguishers will not extinguish the fire.

RESCUE EQUIPMENT AND CLOTHING

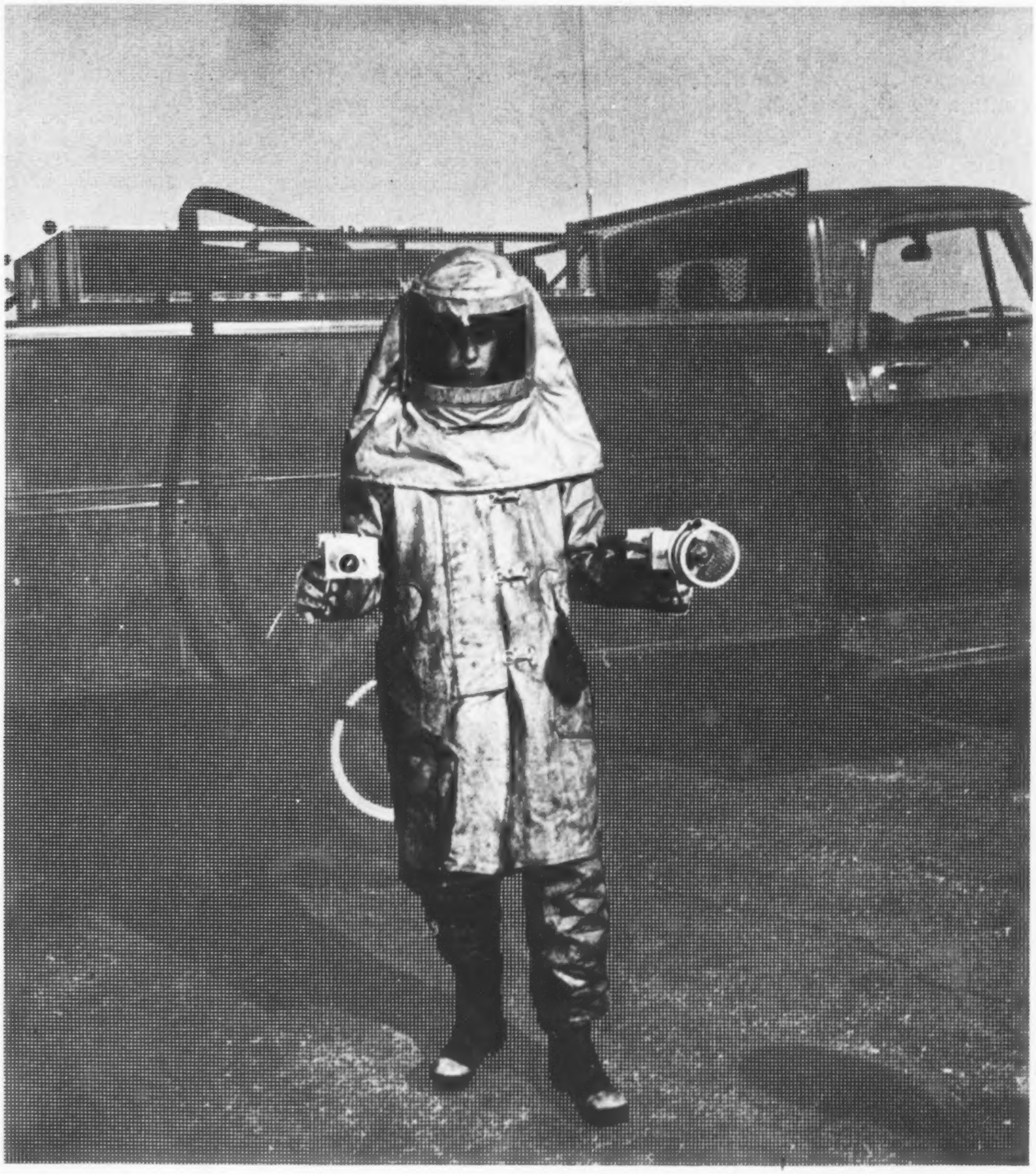
All of the Navy crash trucks have some emergency entry tools as part of the basic equipment furnished with the truck. These include ladders, axes, etc. Other equipment carried consists of a metal-cutting power saw, a Halligan tool, and a crash-rescue toolkit. The station fire chief must see that this equipment is carried on each of the crash trucks assigned to the firefighting crew. Also, one of the vehicles should be designated as a rescue vehicle. It will normally be the first vehicle on the scene, and it will also have these tools, along with some specialized rescue equipment.

The procedures for using the forcible entry tools are covered later in this chapter.

To insure that the equipment is always complete and readily available, the fire chief makes frequent and careful inspections. He must arrange for intensive, continuous training to assure that personnel in all platoons are fully qualified to handle this equipment. This equipment must be restricted to crash-rescue use only.

Aircraft crash/rescue protective clothing is a prime safety consideration for personnel engaged in firefighting and/or rescue operations. Metalized protective clothing offers a means of providing protection to the firefighters because of its high percent of reflectance to radiant heat. Aluminized proximity fabrics have been adopted for use in the Navy crash/rescue program. It is important to point out that these garments are not classified as entry suits, but are known as proximity clothing. As previously stated, the aluminized proximity suit gives the wearer good protection against radiant heat. However, aluminum is a good conductor of heat, and therefore will not give much protection against direct flame contact.

The heat reflective ability of aluminized clothing items is reduced when they are stained



AB.302

Figure 4-12.—Operator holding twinned nozzle assembly.

or otherwise dirty. Additionally, the garments will develop hotspots where the metal flakes off or the fabric cracks or tears. For the above reasons, and to reduce replacement costs, it is imperative that each supervisor insures that all personnel in his charge are completely familiar with the following care and maintenance instructions:

1. Storage should be on hangers, or neatly folded. If folded, the folds should be loose.

Sharp folds or creases will crack the metalized fabric. Do not sit on or place objects on a folded garment.

2. Dirt and soot should be sponged off with mild soap and water, and the aluminum surface dried with a clean soft cloth. Rub GENTLY, so as not to remove the aluminum impregnating the fabric.

3. Grease stains may be removed by the use of drycleaning solvents, isopropanol or perchloroethylene, instead of mild soap. Again, rub carefully. If you rub hard and remove any of the aluminum, the garment will have a hotspot.

4. Foam may be removed by sponging clean with mild soap and water. Hang to dry in the open, or in a place with good circulation. It is realized that during firefighting operations it is not always possible to prevent foam from getting onto protective clothing; however it is pointed out that aluminized protective clothing which has been covered or spotted with foam will have less heat reflection than the suit normally provides.

5. Abrasive, harsh, or corrosive chemicals will react with the aluminum surface and etch the metal and, therefore, should not be used for any reason. Clean the clothing as stated above with mild soap and water and wipe dry; allow to dry at room temperature.

6. Garments should be replaced when the metal wears off or when the fabric cracks or tears. Spraying worn clothing with aluminum serves no useful purpose and is dangerous practice.

7. When wearing aluminized protective clothing, never sit, lean, or lie down, as unnecessary wear and stress will be subjected to the garment.

SHIPBOARD (FLIGHT DECK)

CRASH SALVAGE CREW/TEAM

The crash salvage team's functions are to effect rescue of personnel from crashed and/or burning aircraft on the flight deck, administer "emergency" first aid, fight fires on the flight deck, clear away wreckage, and make emergency repairs to the flight deck and associated equipment. The Aircraft Crash Salvage Officer is in direct charge of the crew under the supervision of the Flight Deck Officer (FDO) and the Air Officer (AO).

The crash salvage crew should consist of experienced personnel highly trained in flight deck firefighting, aircrew rescue, and flight deck repairs. The following is a suggested organization for use during normal flight operations. During limited flight operations, such as helicopter launch/recover, the basic organization and procedures may be modified by local directives.

1. Crash and Salvage Officer—Overall direction and supervision of assigned personnel.

2. Crash/Salvage Chief—Assistant to the Crash/Salvage Officer.

3. Crash/Salvage Petty Officer—A first class petty officer who assists the Crash/Salvage Chief in the direction and placement of firefighting personnel and equipment should a crash occur.

4. Salvage Petty Officer—Supervises and directs men and equipment and insures immediate availability of all required aircraft salvage and removal tools and equipment. The Salvage Petty Officer normally has one assistant.

5. Equipment operators for the crash crane and crash forklift.

6. Minimum of nine firefighters and three rescuemen.

Ideally, each member of the crash/salvage team should be trained and qualified to perform the functions of every other member within the unit. During all launches and recoveries, rescuemen are stationed in the island area, on the alert to move anywhere on the flight deck. They are to be fully clothed in the firefighter's aluminized protective coat and pants and asbestos or aluminized gloves and boots. An aluminized helmet is carried to be donned when needed. The rescuemen should also carry a rescue knife for cutting seat restraint and parachute harnesses. Firefighters standby fog foam stations in the event of emergencies, and provide KNOW HOW in manning the hose lines on fog foam and salt water stations. The crash/salvage team maintains all crash and firefighting equipment assigned to the division. In addition, they comprise the nucleus of the firefighting crew on the flight deck. The crash/salvage team's detailed functions are as follows:

1. Exercise all operating and maintenance safety precautions for firefighting equipment.

2. Exercise all damage control procedures for the flight deck area. Keep all crash and rescue equipment in a state of constant readiness.

3. Assist in on/off loading aircraft.

4. Assist the divisional damage control petty officer.

5. Have custody of and maintain all divisional equipment which is used during flight operations.
6. Have custody of, maintain, and issue all aircraft tiedown chains to squadron personnel on subcustody.
7. Assist aviation fuel crews with washdown of fuel spills.
8. Assist duty support equipment mechanic with crash crane and forklift checklist.
9. Man fire extinguishers during aircraft turnups and starts.
10. Man two aluminized rescue suits during flight quarters.
11. Man two starboard HCFF (high capacity fog foam) and two salt water stations during flight operations.
12. During recovery operations, provide towbars, chocks, and other equipment necessary for removal of aircraft flameout in the arresting gear area, brake failure, flat tire, etc.
13. Man crash crane and crash forklift during recovery operations.
14. Act as safety observers during all phases of flight operations.
15. Provide instructors for indoctrination of new personnel and/or embarked squadron personnel in shipboard firefighting equipment operation and application.
16. Assist the hangar deck crew with collapsed landing gear drills or actual emergencies, such as aircraft falling off jacks, etc.

EQUIPMENT CRANES

Mobile cranes (NS-50 & 60) previously discussed in chapter 2 of this Rate Training Manual are provided on most all aircraft carriers in the fleet. These cranes are capable of lifting and "walking off" with any carrier aircraft; however, the lifting capacities of these cranes are 50,000 and 60,000 pounds, respectively. Therefore, some of the larger type aircraft will have to be defueled prior to lifting (i.e., A5-J, A-3A/B, C-2A). They are an invaluable piece of equipment and should be maintained and operated accordingly.

FORKLIFTS

Crash forklifts used aboard carriers for the purpose of aircraft salvage should be in the minimum lifting class of 15,000 pounds or better and be powered by a diesel engine. The easy maneuverability of the forklift makes it most useful when it is necessary to speedily lift only one portion or side of an aircraft at a time. The padded lifting arm can be inserted under the wing, tail surfaces, or fuselage when necessary to lift an inverted aircraft for rescue purposes. Care should be taken to place the lift arm under a section of the aircraft that will sustain the weight without damage. It is well to remember that the use of the longer lift arm (6 to 8 feet) reduces the weight the forklift can safely lift without the possibility of the forklift tipping over. Due to the tremendous weight capability and stresses occurring in an emergency situation, it is recommended that solid tires be obtained for all forklifts used for crash/rescue operations.

Dollies

Truck dollies (crash) are provided on all carriers for the moving of heavy aircraft components and to serve as aids in moving crashed aircraft. This is a heavy-duty, low-bed dolly of welded steel construction with a hard fiber top surface and four swivel shock absorbing caster type wheels with nonsparking tread. Pipe type rails on all four sides of the dolly provide handholds and attachments for tiedowns. This dolly is designed to support a load up to 12,000 pounds.

These dollies can be modified in many different ways to serve specific purposes. One modification may be a steel structure to form a higher platform for use under a wing or nose section. Also, a heavy steel socket, large enough to insert a landing gear strut with the wheel broken off, is sometimes welded to the top of the dolly. Any modification to the dolly must be sufficiently strong to safely handle the load that will be imposed upon it.

Slings

Aircraft hoisting slings should be used with extreme care when lifting an aircraft in other than the normal three-point attitude relative to the flight deck. Loads on the hoisting sling fittings will be increased if a departure is made from this attitude. Instances of failure have been reported in which attempts were made to raise crashed aircraft which had become lodged in abnormal positions. In such cases it is considered safer to improvise a sling than use the aircraft's usual hoisting sling. Improvised slings should be safeguarded with heavy preventer lines. Improvised slings may be attached to such members as the main landing gear, crankshaft, catapult hooks, or by lines encircling the fuselage or wings at points of maximum strength, such as bulkheads and ribs. Provisions to prevent chafing of surfaces must be provided if salvage operations are intended. Reinforced canvas straps with hook-on provisions should be available in the crash locker for this purpose.

Shipboard Twinned Agent Unit (SBTAU)

In the event of a fire on the flight deck, the first and immediate response will be made by crews manning the SBTAU. The skid-mounted twinned agent unit fire extinguisher is used in applying a "light water" firefighting agent in conjunction with a dry chemical firefighting agent for purposes of rapidly extinguishing fires and preventing reignition of flammable hydrocarbon fuels. It is designed to permit it to be mounted within a compartment on the rear of the MD-3 tow tractor. It can be used in the corrosive salt environment on the flight deck or hangar deck aboard aircraft carriers. The light water concentrate is premixed with fresh water and is contained in an 80-gallon stainless steel cylindrical tank. The mixture is expelled with nitrogen gas through one-half of the twinned handline and nozzle. The "Purple-K" dry chemical agent is contained in an invertible, spherical, steel tank and is expelled with nitrogen gas through the other half of the twinned handline and nozzle. The system allows use of light water or Purple-K separately or both simultaneously.

Components—Arrangement and Function.—The major components which make up this fire extinguisher (SBTAU-2) are described below.

1. Dry Chemical Container—A spherical shaped steel tank is used to contain the 200 pounds of Purple-K agent. It is mounted on bearings to allow rotation just prior to discharge of the Purple-K. The container is inverted and pressurized simultaneously, just prior to discharge, to insure complete aeration and fluidization of the Purple-K. The container is constructed in accordance with the latest ASME Unfired Pressure Vessel Codes for a maximum working pressure of 230 psig and is so stamped. Nitrogen gas enters the container through a 1-inch swivel joint and the gas/Purple-K mixture is discharged through a 1 1/2-inch swivel. These swivels are located on opposite ends of axis of rotation.

2. Light Water Container—An 80-gallon capacity cylindrical stainless steel vessel contains the light water agent. This pressure vessel is also constructed in accordance with the latest ASME Unfired Pressure Vessel Codes for a maximum working pressure of 230 psig and is so stamped. The nitrogen enters the container at the top and light water is expelled from the bottom. The tank is equipped with a liquid level gage for refilling purposes. NOTE: The bleed valve should be opened on top of the light water tank before unscrewing the liquid level gage.

3. Container Caps—Each container is equipped with a 4-inch-diameter fill opening and screw type self-venting pressure cap. The cap is constructed of brass and is equipped with a neoprene gasket for sealing purposes.

4. Nitrogen Cylinder—One ICC-3AA-2400, shatterproof, 400-cubic foot capacity gas cylinder is filled with nitrogen gas to a pressure of 2,400 psig at 70°F. The cylinder is equipped with a lever-operated valve and integral pressure gage. This pressure gage provides visual pressure reading of the gas pressure at all times.

5. Pressure Regulator—One single stage pressure reducing regulator is used to reduce the nitrogen pressure from the cylinder to 230 psig, the Purple-K and light water containers operating pressures. This one regulator supplies both containers.

6. Inversion Cylinder—The dry chemical container is inverted mechanically with two gas operated piston type cylinders. The latch cylinder is mounted under the dry chemical container and the inversion cylinder is mounted by the inlet end of the dry chemical container. When the cylinder valve is opened, the pistons on the inversion cylinder and latch cylinder operate rapidly, striking lugs on the dry chemical container, causing the container to revolve approximately 135°. Since the cylinders are spring loaded, they will return to their original position when the gas pressure is released.

7. Sphere Latch—The dry chemical container, or sphere, is held in position and prevented from rotation by a stainless steel, spring loaded, latch assembly. The sphere is equipped with three latch lugs; one for filling the container (cap straight up), one for the "Ready" position (cap approximately 45° below straight up), and "Operated" position (cap straight down). The latch is released mechanically from the "Ready" position by the latch cylinder.

Just prior to the piston rod striking the lug on the dry chemical container a cam on this rod depresses the latch, thus releasing the sphere. The latch must be released manually when the sphere is in the "Fill" or "Operated" positions.

8. Bleed Valves—Two bleed valves are provided; one on the light water tank and one in the line to the inversion cylinder. Both valves are quarter-turn type ball valves and have to be manually opened and closed.

9. Pressure Relief Valves—Three pressure relief valves are provided: one at the inlet to each container and one on the pressure regulator. All three are spring-operated type and are set at 250 psig.

10. Check Valves—Two check valves are provided; one at the inlet to each container. They prevent the backflow of agent into the nitrogen gas portion of the system. A swing check type valve is used on the dry chemical container and a spring-loaded disc type is used on the light water tank.

11. Discharge Hoses—A twinned type line, 100 feet long, is used to discharge the two firefighting agents. It is constructed of two neoprene lined and neoprene covered hoses held together with a polyester outer jacket. The dry chemical hose is 3/4-inch in diameter while the light water hose is 1-inch in diameter. The neoprene hoses are equipped with brass, male and female, expansion type couplings. The threads are 3/4-inch NPT and 1-inch NPT, respectively. The hose is coiled in a storage compartment on the rear of the extinguisher. NOTE: It is much easier to remove the hose from the hose compartment before charging it with agents.

12. Nozzles—A twinned nozzle is used on the twinned hose to expel the two agents. Each nozzle is equipped with a pistol grip handle and a trigger-operated shutoff valve. The two nozzles are fastened together approximately 2-inches apart to make up the twinned assembly. The dry chemical nozzle is equipped with a Fire Boss Lo-Re-Action discharge tip. It is rated at 4 pounds of Purple-K per second. The light water nozzle is equipped with an aspiration type tip which is directed outward from the parallel planes of the nozzle handle at an angle of 22 1/2°. It is rated at 50 gpm of light water solution.

13. Pressure Gages—Two gages are provided; one for each container. Each gage shows the pressure in its respective tank while the system is operating. Both gages indicate "zero" when the system is in the "ready" condition.

14. Temperature Relief Valve—The light water tank is equipped with a temperature relief at a temperature of 212°F. This is a fusible plug-type valve. When the relieving temperature is reached, the plug material melts allowing pressure to escape. This valve is not reusable and must be replaced after it has relieved.

15. Dry Chemical Agent—The SBTAU-2 is delivered with 200 pounds of Purple-K agent in accordance with Military Specification MIL-F-22287A (WEP).

16. Light Water Agent—Five gallons of 6 percent MIL-F-23905(B) light water concentrate is shipped with each SBTAU-2. The concentrate must be mixed with fresh water at the rate of 5 gallons of concentrate to 75 gallons of fresh water. This may be mixed right in the light water container. However, precautions should be taken to prevent excessive foaming or frothing of the mixture during mixing. NOTE: See filling instructions to properly mix the agent and water.

17. Sphere Position Indicator—The dry chemical sphere is equipped with an indicator to show the position of the sphere at a glance. A hole on the left-hand end of the hood exposes the sphere. Two arrows are painted on the hood and the words "Operated" and "Ready" are painted on the sphere. When the sphere is in the "Ready" position (sphere cap at approximately 45°), the word "Ready" appears between the two arrows. When the dry chemical system has operated, the word "Operated" appears between the arrows. No indication is provided for the fill position since the hood must be removed to obtain this position.

Operation.—When the lever valve on the nitrogen cylinder is pulled to the open position, high-pressure gas, 2,400 psig at 70°F, flows to the regulator. The pressure is reduced to 230 psig by the regulator. The 230 psig gas flows in three directions when it leaves the regulator: to the latch and inversion cylinders to invert the dry chemical container, into the dry chemical container, and into the light water tank. A pressure gage at the inlet of each tank indicates the operating pressure of the tank.

As the gas flows into the light water tank, the light water is forced out the discharge. No gas will be discharged from the light water tank until all of the light water solution is exhausted.

The gas flowing into the dry chemical container aerates and fluidizes the Purple-K agent. As the gas leaves the container, the Purple-K agent is carried along suspended in the gas stream by the velocity of the moving gas. Therefore, a mixture of gas and Purple-K is discharged through the handline and nozzle. Gas will continue to flow after the Purple-K is exhausted since the 400 cubic foot nitrogen cylinder has a capacity greater than that required to discharge all the Purple-K and light water.

This system is protected from excessive pressures by three pressure relief valves; one at each of the agent tanks, and one on the pressure regulator. Each relief valve is set at 250 psig. An additional relief valve is provided on the light water tank. It is a temperature relief valve set to relieve when a temperature of 212°F is reached.

Operating and Maintenance Instructions.—The following instructions should be followed to operate the SBTAU-2 fire extinguisher and to return it to service after use.

TO OPERATE:

1. Open cylinder valve by pulling valve handle forward.
2. Open hose line valves located at left of hose box. NOTE: These valves can be left open at all times to expedite placing unit into operation.
3. Uncoil hose to desired length. NOTE: The hose is much easier to uncoil if it is done prior to charging same.
4. When approaching the fire from the windward side, open dry chemical nozzle, applying agent to the base of the fire. When headway of the fire is gained, open the light water nozzle and apply the agent in a side-to-side motion to cover extinguished fuel with the foam liquid. Work fire slowly from right to left, applying Purple-K and light water, extinguishing the fire in and around the aircraft fuselage for rapid extinguishment rescue of personnel. Fire will stay out. NOTE: Do not apply Purple-K too long a period because you cannot see where to apply light water. If any area needs reworking, back up and proceed with the above technique until all of the fire is extinguished.

AFTER USE:

1. Close nitrogen cylinder valve.
2. Remove the cover.
3. Open both bleed valves.
4. Trip manual latch on dry chemical sphere and roll sphere counterclockwise (when viewed from discharge end) until fill cap is at top. Sphere will latch in this position.
5. Bleed residual pressure of dry chemical sphere through handline. (This clears handline of remaining powder.)
6. With pressure dissipated, loosen cap with the wrench provided on unit and slowly remove cap from each container.
7. Refill dry chemical sphere to top. Replace cap and tighten with wrench. Unlatch sphere and rotate clockwise (when viewed from discharge end) until sphere latches in ready position. (Cap will be approximately at 45° from vertical.)
8. Refill light water container as indicated on Refill Chart on cover, or for complete charge:

   Fill light water tank with approximately 50 gallons of fresh water with a garden hose, then pour 5 gallons of light water concentrate in tank using funnel provided, replace garden hose on bottom of tank and fill slowly, and fill to 1-inch of cap opening. NOTE: It is very important to use this method of filling the light water tank to insure proper mixing of the solution. Replace cap and tighten with wrench.
9. Replace nitrogen cylinder if gage reads below 1,700 psig. To replace: Raise hose box and install "T" handles. Loosen swivel nut between cylinder and regulator, allow pressure to dissipate. Remove regulator. Pull empty cylinder and install full cylinder, gage in up position. Reinstall regulator, tighten swivel nut securely. Remove "T" handles and lower hose box.
10. Close bleed valves.
11. Replace cover. Unit is now ready for operation.

MAINTENANCE:

1. Check nitrogen cylinder pressure daily. Replace if below 1,700 psig.
2. Check twin agent nozzle shutoffs to see that they operate freely. Be sure that nozzle shutoff is in the closed position.
3. Remove cover and manually release latch on the Purple-K sphere and rotate to make sure that it operates freely. Replace cover.
4. Purple-K sphere should always be in the "Ready" position when unit is in standby location.

5. Protect against freezing. If temperature is 32°F or lower, unit will have to be kept in warm spaces on hangar deck, and exchanged to flight deck periodically to maintain it operational.

CRASHES

There are four general classes of aircraft crashes aboard an aircraft carrier: on deck, catwalk, suspension (over the side), and in the water. Each crash must be handled differently, depending on the situation. No standard procedure will apply to all crashes. The primary consideration must be for a ready deck for all airborne aircraft. When possible, an aircraft with a known problem should be landed last. This does not preclude situations that require immediate recovery, such as in-flight fires, impending loss of control due to hydraulic system failure, toxic fumes in the cockpit, etc.

When time is essential, the easiest and fastest method is used regardless of additional damage that will occur to the aircraft. When time is not essential, care is taken to insure that further damage does not occur. It is important that the Crash Salvage Officer or the Crash Salvage Chief be left in full control of clearing a crash from the deck. Squadron maintenance personnel should be outside the perimeter if their assistance is requested.

Since fire is an ever-present danger in all aircraft crashes, each crash must be approached as though the aircraft was on fire. When an aircraft crashes, the impact is usually such that fuel lines and fuel tanks become ruptured. If the aircraft is not already on fire when it comes to rest, fuel fumes are likely to be ignited by hot engine parts, sparks, or electrical shorts.

Since the rescue of personnel in a crash is normally the first objective of the rescue crew, fog-foam nozzles must be trained on the cockpit area and other crew stations to protect the plane crew until rescue can be effected. Upon direction from the crash officer, the hot suit men move in to effect rescue of personnel. Rescuemen should approach the aircraft with due regard for danger areas. If the aircraft is actually on fire, these men must be protected with fog foam and water fog as applicable.

Rescue and forcible entry is discussed later in this chapter. Detailed instructions for each type aircraft are covered in its technical manual (General Information and Servicing section) and in the U.S. Navy Aircraft Firefighting and Rescue Manual, NavAir 00-80R-14.

Catwalk

The rescue of personnel and the fighting of fire in crashed aircraft in a catwalk is somewhat more complicated than an on-deck fire due to the difficulty in getting to the aircraft. The direction of approach is also limited due to the location. Assistance may have to be given to rescuemen in getting to the aircraft. There is also greater danger of ignited fuel running down the side of the ship and into the compartments below the flight deck. Firefighters from other repair parties may be required to aid in fighting these fires.

Suspension Over the Side

An aircraft suspended over the side can present a major problem in rescue of personnel and in firefighting. Care must be taken to prevent the aircraft from being dislodged. A preventer (line of sufficient strength to hold the weight of the aircraft) must be attached to or passed around a part of the aircraft to hold it as soon as possible. Rescue and firefighting operations may have to be made from the hangar deck. Line should be passed to the aircraft crew to assist them from the aircraft. At times it may be necessary to send a rescueman to the aircraft to effect the rescue of injured personnel. The method of getting rescue personnel to the aircraft depends on the location of the aircraft, the type of aircraft, the condition of the aircrafts, etc.

In the Water

When an aircraft crashes into the sea in the vicinity of the ship which is underway, the aircraft siren is sounded from primary fly control. This is followed by "crash in the water (port/starboard) side," passed from primary fly control over the 5MC announcing circuit.

Whenever flight operations are being conducted, the LSO stations a man on the port walkway and a man on the starboard walkway at the afterend of the flight deck. Each station is equipped with the following equipment:

1. Two-man liferaft.
2. Liferings.
3. Dyemarkers.

4. Sealed electric float lights (for night or low-visibility operations only).

These men are instructed to drop this equipment, without further orders, into the water if a crash occurs in the water on their side of the ship. The equipment must be dropped in the vicinity of the crashed aircraft. In no case should the equipment be dropped so close to the aircraft or personnel in the water that there could be danger of its striking them.

Since it it not normally practicable for a carrier to interrupt air operations in order to effect a rescue, the ship's helicopter or vessel in company nearest the scene of the crash takes appropriate action. If the helicopter and vessel in company have not observed the crash, they are notified by the carrier to proceed with rescue operations.

Most aircraft crashes at sea affect the carrier flight deck in some way, whether it was an on-deck, suspension over the side, or into the water crash. Some in-the-water crashes are from aircraft that attempted a landing, then crashed, and continued over the side. A check of the flight deck must be made for damages to the deck and/or equipment, for parts of the crashed aircraft, and for injured personnel before giving a clear deck for the continuation of landing operations.

Salvage and Jettisoning

As in the combating of crash fires, the specific action to be taken in clearing the flight deck can only be determined after an on-the-spot analysis of the crash situation. In any event, the time element usually proves to be a very important factor. Crashes that interfere with flight operations must be cleared by the most expeditious means available.

On-deck crashes that render the landing gear inoperable may be removed by supporting the aircraft on one or more dollies. Automotive type jacks or mobile cranes may be used to lift the aircraft in order that these dollies can be placed under the aircraft. The dollies must then be secured to the aircraft by means of lines or straps. The aircraft can then be towed or pushed clear of the landing area.

Catwalk crashes and overside suspensions present many and varied problems. Depending upon the situation, various items of crash equipment will be used (sometimes all the equipment available).

The steps in recovering a crashed aircraft vary considerably, depending upon the situation. Basically, they will consist of righting the aircraft so that it can be hoisted or mulehauled (bodily dragged) up on deck.

The location, attitude, and condition of the aircraft to be jettisoned, time available to perform the jettisoning operation, and the equipment on hand with which to work are some of the problems confronted by the ABH when jettisoning an aircraft.

The aircraft to be jettisoned may be in an inverted position on the flight deck, have one wheel in the catwalk, two wheels in the catwalk, or it may have the landing gear completely sheared off.

The situation and problems vary with each aircraft; therefore, no single step-by-step procedure can be given that would be applicable for use in every case where an aircraft is to be jettisoned. Common sense and resourcefulness are important assets in such operation.

In general, the jettisoning operation is carried out as follows:

The aircraft to be jettisoned is placed on the outboard edge of the nearest deck edge elevator. The safety netting around the elevator must be dropped so the aircraft will clear it. If feasible, the ship then executes a high-speed turn to port or starboard, depending on which side of the ship the aircraft to be jettisoned is located. The execution of this turn creates a list to the ship which in many cases will be sufficient to cause the aircraft to be jettisoned to clear the deck edge elevator, and at the same time minimizes the possibility of jettisoned aircraft becoming fouled in the ship's screws.

If the list to the ship created by this maneuver is not sufficient to cause the aircraft to clear the elevator, or if it is not feasible to maneuver the ship in this manner, the aircraft may be pushed clear utilizing the aircraft mobile crash crane.

CREW ENTRAPMENT AND RESCUE

With new, modern aircraft being introduced into naval aviation, many design changes have resulted that affect personnel (Aircrew(s)) rescue procedures under emergency operations. Supervisory personnel must take it upon themselves to keep abreast and up to date with these changes and modifications as they occur to enable him to inform and train his crash rescuemen.

Lack of this information could result in fatal or serious injury to the rescueman as well as to those whom he is attempting to rescue.

Of necessity, this section is general in nature and does not include equipment, procedures, or modifications for each type aircraft, but rather to illustrate that rescuemen familiarization is the responsibility of, and must be accomplished by, the supervisor in his ever-changing and continuous training curriculum.

The supervisor should include in his training curriculum as a minimum the following suggested topics (per each type aircraft), as well as information of changes and/or procedures gained through his own research study, and experience:

1. Aircraft description.

    a. General identification of: mission, crew, engines, armament and ordnance stores, and type of ejection system(s).

    b. Interior of aircraft arrangement: fuel, oil, hydraulic fluid, compressed air, and liquid oxygen tank location and capacity. Location and quantity of ordnance stores.

2. Danger areas:
    - a. Engines (intakes and exhausts).
    - b. Wheels.
    - c. Canopies and ejection seats.
    - d. Drogue gun.
    - e. Weapons.
3. Cockpit entry for:
    - a. Normal conditions.
    - b. Manual conditions.
    - c. Forcible entry.
4. Prevention of pilot suffocation: oxygen mask and helmet.
5. Crew release from seat for:
    - a. Automatic.
    - b. Manual.
    - c. Cut or emergency conditions.
6. Firefighting techniques for:
    - a. Engine pods.
    - b. Aft fuselage compartments.
    - c. Tailpipe.
    - d. Wheel and brake assemblies.
7. Deactivation of:
    - a. Battery.
    - b. Engine.
    - c. Ejection seats.
    - d. Canopy.
    - e. Face mask precautions.
8. Special tools:
    - a. Hoisting slings.
    - b. Jacking instructions.
9. Hoisting and towing under normal and emergency conditions.
10. Crash firefighting criteria:

    a. Rescue operations are the primary objective.

    b. When an aircraft crashes, it is too late to make a study of the aircraft to determine the best methods of lifesaving and firefighting.

    c. No fire hazard in or in close proximity to an aircraft is minor nor slight enough to be ignored.

    d. Be familiar with identification colors for aircraft tubing. Should tube cutting be necessary, do not increase fire hazard by mistakenly cutting tubing containing flammable fluids.

    e. When entrance is gained, the first step is to determine crew and environmental conditions. Where immediate hazards are beyond control of rescuemen and time is limited, remove aircrew at once. In other cases it may be necessary or practical to reduce hazards first and thereafter remove personnel.

    f. In a crashed aircraft, it is of immediate importance to see the master switch (battery switch) is placed in the "OFF" position.

    g. The fastest removal from safety belt and shoulder harness is to operate the release catch itself, not cut the belts.

    h. Extreme care must be taken in removing aircrewmembers if they appear to be injured; however, in no case should rescuemen delay in removing victims from dangerous locations, as there is always danger of flash fires.

    i. Medical assistance should be introduced at the earliest possible time. Do not assume that occupants are uninjured or that they are beyond help.

    j. No part of the aircraft structure should be moved unless it is absolutely essential to rescue operations.

FORCIBLE ENTRY TOOLS

Whenever possible, access by means of door openings or hatches should be used when rescuing flight crew personnel from crashed aircraft. These door openings and hatches may be opened from both inside and outside the aircraft. Cockpit canopies and emergency escape hatches are equipped with emergency release mechanisms. These release mechanisms may be operated from both inside and outside the aircraft. When actuated, most emergency release mechanisms allow the entire canopy, cockpit enclosure, door, or hatch to fall away. Thus, easy and speedy exit or access is facilitated.

If the emergency releases fail to operate, it becomes necessary to forcibly enter the cockpit. To accomplish this, in case of a Plexiglas or safety glass type canopy, use is made of a standard hatchet-size fire ax.

Direct the pointed end of the ax on the canopy near the center of the bow. One healthy blow will knock a hole through the canopy. Chop down from the hole toward the sill, then along the frame. The canopy glass will break up into large pieces. If the aircraft is on fire and the canopy is soft and sagging, apply CO_2 to harden it before chopping. At normal temperature, CO_2 is not needed.

Extreme caution must be observed when canopies covering ejection seats are shattered, lest the blows actuate seat ejection mechanisms.

A portable, electrically-powered metal cutting saw of the type carried on the MB-5 crash rescue truck may be utilized when forcible entry of a nearly-all-metal type canopy is required. If a portable power saw is not available, the metal canopy can be chopped through with an ax and ripped apart with a Halligan tool.

Each activity that supports flight operations should designate one or more crash rescue vehicles to carry and be equipped with rescue and forcible entry equipment. The TAU vehicle, where provided, is ideally constructed as a rescue vehicle. The designated vehicle or vehicles should contain equipment suitable for either normal or forcible rescue of aircrew personnel.

The power saw and portable generator equipment includes a carriable generator rated at 2.5 kw, 180 hertz, 230-volt, 3-phase a.c.; a 10-inch circular saw; and two 500-watt floodlights and necessary cable and connectors. The current produced by the generator permits operation of power tools under severe conditions which would stall conventional equipment, and also permits the use of more compact, lighter weight tools. Tools, lights, switches, and connectors are explosionproof and weatherproof. The generator, which is also weatherproof, has four service outlets; two outlets supply 230-volt, 3-phase a.c. for the circular saw, the other two furnish 110-volt a.c. for the floodlights and other conventional tools.

NOTE: This power forcible entry equipment should be subjected to rigid and frequent inspection for operation and should also be restricted for the exclusive use of aircraft fire and rescue operations.

SOURCES OF INFORMATION

As stated previously, there are many different sources of information available concerning aircraft fire/rescue. The senior ABH will find these sources very valuable in maintaining an effective training program for fire/rescue crews aboard ship, as well as on shore stations. These sources include, but are not limited to, the following:

1. NavAir 00-80R-14, U.S. Navy Aircraft Firefighting and Rescue Manual. The Crash Crew information charts in sections 6 and 9 are of special interest for rescuemen.
2. Type Aircraft Technical Manual-General Information and Servicing section.
3. Squadron and/or Base Aviation Safety Officer.
4. NavAir Instruction 11320.8, Aircraft Firefighting and Rescue Training Course Outline.
5. Navy Safety Center, Norfolk, Virginia.
6. NavPers 10300-B, Aviation Boatswain's Mate H 3 & 2.

CHAPTER 5

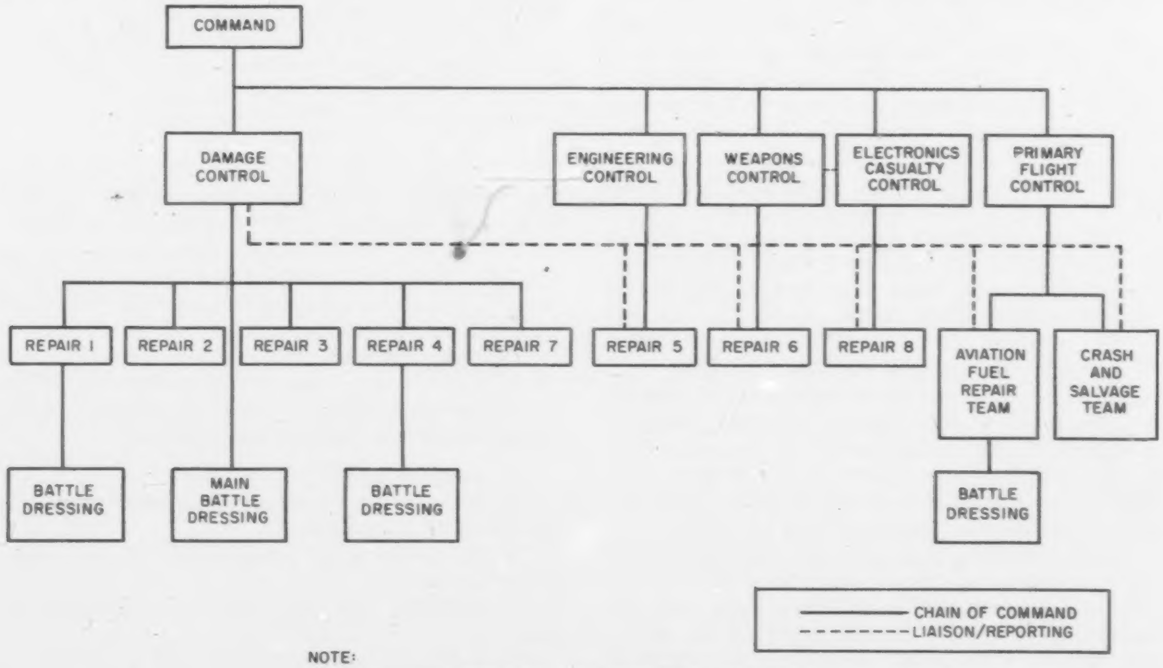
SHIPBOARD FIREFIGHTING

The handling of casualties such as the fighting of shipboard fires, the accomplishment of emergency repairs, and the maintenance of watertight integrity are accomplished by repair parties, which are an integral part of the damage control orgainzation.

Every division and man aboard ship is concerned with some aspect of damage control. Your success as a leading petty officer in the damage control organization depends on your complete understanding of the system and the ability to help fit its parts together so that they work properly. In order to do this, you should have a good fundamental knowledge of the damage control organization as it works in battle and in normal day-by-day routine. (See fig. 5-1.)

The damage control organization consists of Damage Control Central and the repair parties. The Engineering Officer, as the Damage Control Officer, is responsible for damage control. The Damage Control Assistant, who is under the Engineering Officer, is responsible for establishing and maintaining an effective damage control organization. Specifically, the Damage Control Assistant is responsible for the following:

1. The prevention and control of damage, including control of stability, list, and trim. He supervises placing the ship in the material


COMMAND
DAMAGE CONTROL
ENGINEERING CONTROL
WEAPONS CONTROL
ELECTRONICS CASUALTY CONTROL
PRIMARY FLIGHT CONTROL
REPAIR 1
REPAIR 2
REPAIR 3
REPAIR 4
REPAIR 7
REPAIR 5
REPAIR 6
REPAIR 8
AVIATION FUEL REPAIR TEAM
CRASH AND SALVAGE TEAM
BATTLE DRESSING
MAIN BATTLE DRESSING
BATTLE DRESSING
BATTLE DRESSING
CHAIN OF COMMAND
LIAISON/REPORTING

NOTE:

BATTLE DRESSING STATIONS WILL VARY WITH DIFFERENT CLASSES OF SHIPS. APPLICABLE STATIONS FOR A SPECIFIC SHIP MAY BE MODIFIED AS NECESSARY.

AB.601

Figure 5-1 —A typical damage control battle organization.

condition of closure ordered by the commanding officer.

2. The training of the ship's personnel in damage control, including firefighting, emergency repairs, and nonmedical defensive measures against gas and similar weapons.

The General Emergency Bill sets up the necessary staffed organization for controlling the effects of any shipboard emergency, such as collision, explosion, or fire, either in port or underway. The bill is based on the ship's regular damage control organization. The engineering officer is responsible for maintaining the bill so that it is current and ready for execution at all times.

Fires occurring during action or while the ship is at general quarters, with a full crew on board, are handled as a battle casualty. These fires, which may occur in port or at sea, are fought by repair parties and personnel in the vicinity, under the direction of damage control central, or the air officer (for fires in aircraft and aircraft parking areas). When a fire occurs in port and there is a partial crew on board, the duty fire party will take over.

Repair party personnel, members of the primary shipboard firefighting units underway, always go to their general quarters station on fire call. On some ships, the General Emergency Bill may designate the in-port fire party as the primary firefighting unit. Repair party personnel assigned to the in-port fire party proceed to the scene of the fire with assigned equipment.

The in-port fire party is composed primarily of personnel in the regular damage control repair parties, with each duty section having an effective firefighting force. Heads of departments, division officer, and leading petty officers concerned should consider training and experience of repair party personnel in making assignments in accordance with the general emergency bill. Care must be exercised to avoid assigning personnel of the in-port fire party to additional details or to other duties in port which require absence from the ship.

Repair parties provide the only personnel immediately available to fight fires during action. Other personnel must leave their primary duty should they have to fight a fire. It is essential that a systematic procedure for fighting fires be established. Loss of valuable time will result if the decision as to the method to be used in fighting a fire is not made immediately.

Members of a repair party will generally be assigned to firefighting positions as follows:

1. Hosemen.
2. Plug man.
3. Access men.
4. Foam proportioner operator.
5. Foam supply men.
6. Portable CO_2 men.
7. Oxygen breathing apparatus and aluminized fire-protective clothed men.
8. Tenders for men wearing breathing apparatus and aluminized fire-protective clothing.
9. Ventilation detail.

The senior man in the firefighting party is designated as the group leader. His first duty is to get to the fire quickly, investigate and determine its nature, and supervise his team in fighting the fires. He must make decisions as to whether additional or different equipment is required, and also the number of personnel required for fighting the fire.

Although firefighting is one of the most important functions, the repair parties have other duties for which they must organize and train. Some of these are chemical warfare defense, radiological defense, biological defense, investigation of damage, making repairs, etc.

The number and the ratings of men assigned to a repair station, as specified in the battle bill, are determined by: (1) the locale of the station, (2) the portion of the ship assigned to that station, and (3) the total number of men available for all stations. All repair stations on aircraft carriers normally have men in the DC, HM, and EM or IC ratings assigned to them.

Each repair station will have an officer in charge. The second in charge of a repair station is, in most cases, a chief petty officer who is qualified in damage control and is capable of taking over the supervision of the repair party.

A set of operating instructions should be posted at each repair station. In general, these instructions will include the following:

1. Purpose of the repair party.
2. Specific assignments of space for which the party is responsible.
3. Instructions for assignment and stationing of personnel.
4. Methods and procedures of communications.
5. Sequence of command and procedures.
6. List of basic damage control bills.
7. Instructions for handling equipment such as sprinkler systems, lighting, fire doors, etc.
8. Functions of NBC defense and the decontamination of personnel.

9. An inventory list of all damage control equipment provided for the repair party.

The organization of a repair party should be such that maximum utilization of the specialities of the men assigned to it is realized. Though each man in a party is assigned specific duties in the organization of the repair party, his responsibilities are not limited to these specific duties. He must perform such other duties as are assigned to him by the officer or petty officer in charge of his party, crew, etc.

In addition to the ship's eight repair parties, there are two repair teams in the Air Department—the Aviation Fuel Repair Team and the Crash Salvage Team. These two teams consist of personnel highly trained in the maintenance and repair of fuels systems and aircraft firefighting and personnel rescue. They work in close coordination with, and may be called upon to assist, other repair parties.

Repair 1 is responsible for firefighting and damage control in the hangar deck area. In some carriers such as the larger CVA's, this repair station is divided into three substations or groups—Repair 1F (hangar deck forward); Repair 1B (hangar deck amidships); and Repair 1A (hangar deck aft). In others, such as certain of the smaller CVA's and CVS type carriers, only two subdivisions (Repair 1F—hangar deck forward; and Repair 1A—hanger deck aft) may be found. The basic difference in these organizations is that the hangar deck forward area is subdivided into hangar deck forward and hangar deck amidships in the case of the larger CVA type carriers.

Since men from the ABH rating are normally assigned to the hangar deck forward and hangar deck amidships stations, only these two stations are discussed here, and they are discussed together. On most carriers, the hangar deck aft station is manned primarily by personnel from AIMD department. This station's responsibilities are similar to those of the forward station or stations.

HANGAR DECK CREW

The Hangar Deck Officer (V-3 Division Officer) is normally responsible for the 1F and 1B repair stations. In addition to the ABH, men from the MM, DC, HM, and EM or IC ratings are normally assigned to these repair stations. The Hangar Deck Chief is second in charge of the party. The hangar deck crew is responsible for the operation of assigned firefighting equipment such as the hangar sprinkler systems, water curtains, high capacity fog foam (HCFF) monitors and handlines, aircraft elevators, conflagration stations in hangar bays 1 and 2, and the hangar separation ballistic doors. If the hangar deck is involved in a fire, the Hangar Deck Officer is charged with the safety of personnel and equipment and the activation of the appropriate firefighting equipment.

FLIGHT QUARTERS

Repair 1F and 1B will not be fully manned during flight quarters unless specifically ordered by the air officer. The partial manning of this repair party during flight quarters normally consists of manning the conflagration station in each hangar bay area assigned to the repair party. Two men are normally utilized in manning each station. One man serves as talker and controls operator. The other man assigned serves as a roving patrol for the hangar bay area served by his assigned station.

GENERAL QUARTERS

During general quarters, Repair 1F and 1B are responsible for the material condition of the hangar deck structures and the hangar deck machinery and firefighting equipment forward of and including the after hangar bay doors (division doors). This includes the aircraft elevator machinery, platforms, roller curtains, elevator doors, hangar bay doors, and such firefighting equipment as CO_2 extinguishers, foam monitors, hangar deck sprinklers, and other sea water outlets.

This machinery and the equipment, other than the aircraft elevators, are normally operated by members of these repair parties during general quarters. The elevator safetymen and the men manning the elevator machinery spaces are usually members of these repair parties. The material condition and the operation of the hangar deck lighting system are also a responsibility of Repair 1F and 1B.

FIREFIGHTING EQUIPMENT

The hangar deck of an aircraft carrier is one of the most dangerous fire areas on the ship. There is always a large quantity of fuel in the aircraft spotted there with the ever-present danger of leakage. Aircraft must be spotted very close together, which can present a problem in getting to the source of a fire. Due to the ever-present danger of fire and the difficulty of reaching it, most of the firefighting equipment on the hangar deck can be operated by remote control. These remote controls are located in the conflagrations stations.

Conflagration Stations

A conflag station is provided in each hangar bay. This station must be manned at all times by fully qualified personnel. These men are responsible for the proper and timely use of firefighting equipment on the hangar deck that can be operated by remote controls installed in their stations.

Each hangar foam monitor control is duplicated in the conflag station. An open-close pushbutton is located in the conflag for each monitor in the same bay with the conflag station. On ships which have hangar division doors, a master switch and remote indicating lights are provided for starting all monitors in the adjoining hangar bay(s). No close position is provided with the master switch(es). In instances when it is necessary to resort to the use of the master switch, starting of the remote foam system will energize the indicator lights associated with the master switch.

There are also controls in the conflag station for the operating of the hangar division (fire) doors, elevator doors, and lighting system associated with the hangar bay in which it is located.

Ballistic Doors (Fire Doors)

Fire or division doors are large metal doors athwartship that are used to divide the hangar deck into sections (bays). This compartmentalizing of the hangar deck facilitates the isolation of hangar deck fires and/or NBC contamination. Also, as their name implies, they limit the ballistic damage on the hangar deck due to explosions. Hangar deck personnel must insure that no aircraft or equipment is spotted in such a manner that blocks the operation of these doors.

High Capacity Fog Foam Monitors and Handlines

The hangar deck foam hose stations are located alternately port and starboard in the general vicinity of the injection stations from which they are supplied. Equipment at each of these stations consists of one 3 1/2-inch and one 2 1/2-inch foam nozzle with quick-acting shutoff valve, stream shaper for each nozzle, 150 feet of 3 1/2-inch and 100 feet of 2 1/2-inch cotton rubber-lined hose; 100 feet of each size hose should be connected to the foam service outlet valves ready for use. The monitor stations are fitted with a 3 1/2-inch outlet and a 2 1/2-inch hose valve. A swivel type monitor is connected to the 3 1/2-inch outlet. Monitors are fitted with 3 1/2-inch fog-foam nozzles and stream shapers. These nozzles do not contain quick-acting shutoff valves. A 2 1/2-inch foam nozzle and stream shaper are also provided at each monitor station. The 2 1/2-inch firehose for these stations is obtained, as required, from adjacent fireplugs.

A pushbutton is provided adjacent to the monitors for operating the station. In order to prevent inadvertent operation of the station, the pushbutton is fitted with a sheet-metal enclosure.

Each hose or monitor station is connected to the injection station by the X50J sound-powered telephone circuit.

A buzzer is provided at each outlet for calling the injection station. The conflagration control station can call each injection station supplying outlets in the same or adjacent hangar bays by means of a selector switch.

Generally, where the fire is over 40 or 50 feet from the monitor, the stream shaper should be put on the nozzle to insure that the foam will reach the fire. The stream shaper cannot be placed on the nozzle while it is in operation. Operating the pushbutton controlling the valve in the monitor supply branch is the only action required to put the monitor in operation.

The monitors may also be put into operation from the second deck by means of the manual control in the solenoid which operates the 4-inch valve. This means of operation should be reserved for large fires which make local control of the monitor remote control from the conflagration station impossible or where electrical control fails. Since hangar conflagrations are always a possibility whenever fueled aircraft are present in a hangar, the monitor should always be trained athwartship at the angle of elevation (or depression) calculated to give the greatest coverage without undue impingement on the overhead or parked aircraft.

The monitors can be operated with little or no decrease in efficiency, with the barrel removed from the yoke. Removal of the barrel will decrease the length about 15 inches and will permit the monitor to be trained athwartship with practically no interference to planes parked nearby. The threads on the monitor yoke are the same as those on the barrel so the change can be made without any alterations. There are a few monitor stations which are recessed alongside of bulkheads. Retention of barrels on these monitors will be necessary in order to avoid blanking off portions of the area protected.

Firefighting

NOTE: In the event of fire in the hangar, the FIRST and IMMEDIATE response will be made by the Shipboard Twinned Agent Unit (SBTAU).

As has been previously stated, foam service outlets are installed fore and aft of the hangar, port and starboard. The 3 1/2-inch foam service outlets at these stations are not fitted with monitors. A study of fires which have occurred on aircraft carriers reveals that the majority of fires take place at or near the midship section, leaving the fore and aft ends of the deck relatively safe for the launching of firefighting operations after any initial blasts have subsided. It is intended that spare firehoses and nozzles be stowed behind bulkheads in sheltered spaces close to these fore and aft foam service outlets. It has also been determined that satisfactory progress can be made in hangar deck firefighting where fire parties advance from the fore and aft ends and simultaneously converging on the fire with high-capacity foam gear. As progress is made toward the fire, supplementary foam lines can be operated from other foam service outlets made accessible in the course of the advance. Operations of the monitor nozzle foam streams and lines out of range as a result of the advance should be secured by the fire parties as soon as possible to prevent too great a drain on the system.

It is not recommended that the hangar sprinkling system be operated while using the foam system. The sprinkling system can be used effectively to control the intensity of a hangar conflagration should events prevent immediate application of fog foam. It should be secured immediately when the fog-foam system is started. The capacity of the ship's pumps is not sufficient to supply both the hangar sprinkling system and the fog-foam system simultaneously of pressures required for efficient operation. Judicious use can be made of the hangar sprinkling system for cooling down the structure after the fire has been extinguished. Extreme care must be exercised while doing this to prevent the foam blanket from being broken up to the extent that reflashes may occur.

When general, fire, or flight quarters are sounded, all foam injection stations should be manned and foam proportioner pumps primed and placed in operating condition. If fire develops on the hangar deck, water curtains at both extremities of the area involved should be placed in operation; and hangar doors should be closed to form a boundary for the fire. Foam monitor nozzles covering the involved area should be turned on, thereby reducing the temperatures within the area and furnishing a foam blanket. If fire or other damage makes foam monitor nozzles within the involved area inoperative, the 2 1/2- and 3 1/2-inch foam lines located forward and aft should be advanced into the involved area to extinguish the fires. When the fire is beyond the reach of the 3 1/2-inch hose lines at the fore and aft ends of the hangar, the hoses should be brought up and connected to the nearest operable monitor outside the involved area. The use of the stream shapers on the portable lines will be dependent upon the severity and extent of the heat wave created by the fire. They should not be used at close range since the foam is delivered with such force to a localized area that it tends to break up the foam blanket. Monitor nozzles should be shut down when mopping up (with the 2 1/2-inch lines) has been started, and the water curtains should be cut off as soon as all fire has been extinguished and the involved area sufficiently cooled to be certain that no flashback will occur.

The reflash watch should then be set with as much equipment as was used at the end of the fire. New crews should be assigned with leaders who were on the original fire party (when possible). A maximum effort should be then made to reservice the foam injector stations. Some sort of effective security from the crowd which collects should be established. The foam blanket should be kept intact as long as necessary to insure that the heat retained in the metal decks, etc., does not cause reignition. Remember, foam also insulates and prevents rapid dissipation of the heat. One method of determining the heat retention of decks, etc., is to check the metal temperatures on the backside of the metal plates that were involved in the fire area.

Movement of Aircraft From Fire Areas

Movement of aircraft from or on the hangar deck during a hangar deck fire is severely restricted. Once a fire starts, the division doors must be closed and no aircraft can be moved. Aircraft may have to be moved on the hangar deck to provide access to a fire in a compartment whose entrance is from the hangar deck. At times it may also be necessary to move aircraft away from a potentially hazardous area such as a large fuel spill.

At times when jet-engined aircraft are taxied directly onto an elevator and lowered to the hangar deck, a fire may occur in the engine or engine bay from excess fuel when the engine is shut down. When the fire is in the engine tailpipe, the fire normally can be extinguished by dry running the engine, using a starter unit. When the aircraft is on a center-of-the-deck elevator, the elevator must be raised to the flight deck level to perform this operation. On a deck edge elevator it may be performed on the hangar deck level. When the fire is not in the engine but in the engine bay or fuselage, CO_2 must be introduced through one of the fire doors to extinguish it. Some carriers may require that an aircraft fire of any nature upon engine shutdown on the hangar deck be sent to the flight deck level.

The ship's instructions should cover the procedures to be taken in regard to hangar deck fires. The hangar deck chief and leading PO should be familiar with these instructions and the procedures for extinguishment of fire in all types of aircraft that may be assigned to the ship.

FLIGHT DECK CREWS

In a fire or other emergency situation, the flight deck crews will keep in mind their primary function as aircraft handlers, moving aircraft that hinder firefighters from controlling conflagrations or aircraft that would otherwise be damaged by fire; however, they must be ready for immediate response to fire and/or emergency situation either by taking the proper action personally or in direct support of the Crash Salvage Team.

NOTE: The primary duties and responsibilities of the Aircraft Crash Salvage Team are discussed in chapter 4 of this Rate Training Manual.

FLIGHT QUARTERS

During flight quarters, the major concerns of the Crash Salvage Team are the handling of crashed aircraft and the manning of key firefighting equipment and/or apparatus, while two men dressed in aluminized fire-protective suits stand by in the fly two area or as directed by the Crash Salvage Officer.

The Air Officer is charged with the general direction in the handling of all crashes which occur; the Flight Deck Officer is charged with the general supervision of the flight deck in the vicinity of the crash or emergency area.

A medical officer (flight surgeon) and one or two HM's are on duty on the flight deck during flight quarters in order to render first aid to personnel involved in mishaps related to flight operations.

GENERAL QUARTERS

During general quarters, the Crash Salvage Team becomes part of the damage control organization. (See fig. 5-1.) The damage control organization is necessarily an integral part of the engineering department organization. The damage control assistant is charged with the overall coordination of all damage control matters.

These teams are peculiar to aircraft carriers and ships equipped for manned helicopter operations. On aircraft carriers, an officer or chief petty officer of the air department is in charge.

On ships equipped for manned helicopter operations, the appropriate deck, engineering, and damage control personnel are assigned.

The men assigned to these teams should be trained and drilled in the following:

1. Methods of investigating and reporting damage.
2. Controlling and extinguishing fires.
3. Isolating damage to piping systems.
4. Rescuing personnel and caring for the wounded.
5. Operating all types of damage control equipment.
6. Correct setting of material conditions of readiness.

EQUIPMENT

Some of the equipment and firefighting apparatus related to flight operations on the flight deck is similar to the equipment previously described for the hangar deck crews. The high capacity fog foam (HCFF) stations on the flight deck correspond to those on the hangar deck and are supplied with foam/sea water solution from the injector station below decks. The fireplug locations are placed so that the best deck coverage is available. Other equipment includes the SBTAU (Shipboard Twinned Agent Unit), portable CO_2 and P-K-P (dry chemical) extinguishers, and MB-5 crash rescue trucks. As on the hangar deck, in the event of fire on the flight deck, the FIRST and IMMEDIATE response will be made by the MB-5, until the third generation TAU is available throughout the fleet (i.e., 1973-1974).

WATER WASHDOWN SYSTEMS

Due to the exposed nature of the flight deck, over which the Crash Salvage Team has responsibility during general quarters for damage control purposes, personnel assigned to this team must have a thorough knowledge of nuclear, biological, and chemical warfare. Drills conducted by the Crash Salvage Officer should emphasize training in these matters as well as standard damage control procedures.

The purpose of the washdown system is to help minimize the effects of the radiation hazards of radioactive fallout by creating a spray of water over the entire flight deck and flight deck area. There are two types of systems being utilized, and are as follows:

1. The permanent system. This system consists of an arrangement covering the entire flight deck and consists of flush deck type nozzles which are fed by piping installed under the flight deck. During an actuality, word will be passed from the carrier's DCC (Damage Control Central), "Commence water washdown." Supply valves feeding the system are then turned on, putting it into operation.

ShipAlt 3410 provides for a light water capability for the water washdown system as a firefighting option of the permanent systems only. Briefly, this water washdown/light water firefighting system is as follows:

a. The flight deck portion of the washdown countermeasures system, depending on each particular flight deck, is rearranged into 12 to 20 zones. Each zone is 125 feet long and covers approximately half the width of the flight deck. Additional sprinklers are provided to cover the after end of the flight deck, and any other flight deck area which would not be covered during a condition of zero relative wind, at the rate of 0.06 gallons per minute per square foot.

Existing plastic piping in the flight deck areas or zones must be replaced with suitable metallic piping.

b. All existing HCFF (High Capacity Fog Foam) 300-gallon protein foam concentrate tanks are replaced with 600-gallon stainless steel (CRES) tanks for the stowage of the fluorocarbon concentrate, and the original stowage racks and equipment are removed for the refill supply of protein foam concentrate. Refill of the fluorocarbon concentrate is accomplished by a 1 1/2-inch fire hose connection near the top of the tank.

c. Positive displacement pumps are installed on a one tank-one pump-one zone basis to inject the fluorocarbon concentrate at the rate of 6 percent, plus or minus 1 percent, into the salt water supply lines to the washdown system. An exception is the fantail sprinkling/aftermost zone of the flight deck, which may be served on a one tank-one pump-TWO zone basis.

d. Duplicate control panels are installed in both Primary Fly Control and the ship's pilot house. These panels are laid out as flight deck diagrams, with the controls for each zone in the corresponding zones of the panels.

Pushbutton controls are provided for operating any zone as a water sprinkling system (washdown), or as a Light Water firefighting system (i.e., separate buttons for sprinkling group control and for injector pump control).

Indicator lights for each zone are also provided to show SALT WATER ON, INJECTOR ON, and INJECTION OFF. INJECTION OFF must be wired to function only when SALT WATER ON is lighted. A lockable, two-position master switch, as part of, or adjacent to each panel, must be installed. This switch must have sections wired in series with the SALT WATER ON buttons of the local panel. This switch is also wired to sound an alarm in the ship's Damage Control Central.

The fantail sprinkling system is controlled by independent controls installed in the jet engine test stand control cubicle on the fantail.

The HCFF (High Capacity Fog Foam) generators operate independently of the water washdown/light water firefighting system; however, deliver proportioned salt water and fluorocarbon mixture for firefighting operations.

2. The interim system. This system is installed on the older type carriers or carriers that do not have the permanent provision. The interim system is portable since flight deck operations cannot take place with the system installed. This system consists of quick connecting, lightweight aluminum pipes with spaced nozzles. Each array or pipelines are laid out athwartships at about 40-foot intervals. Then each array is attached to the deck edge fireplugs by a short length of fire hose. Additionally, each array must be secured to the aircraft tiedown padeyes to prevent them from being blown about by the wind. The standard protective covers that are provided for aircraft should be installed on each aircraft on the flight deck (time permitting) to prevent salt water and/or contamination from getting into the aircraft.

FLIGHT DECK REPAIRS

After any aircraft crash, the flight deck must be checked for and cleared of any loose gear and parts. Any damage to the deck that would affect the recovery of aircraft must be temporarily repaired.

Methods of effecting temporary repairs should be studied, and materials for making repairs should be assembled, prefabricated, and stowed in the most convenient locations. Drills should be conducted to familiarize the crash salvage team (flight deck crews) in the locations and methods of assembly and use of the prefabricated materials.

Due to the wide variation in the extent of damage to the flight deck, prefabricated patches of various sizes must be provided. Certain small holes in wooden decks may be effectively repaired with fireproof plywood strips. Strips that are 12 inches wide, 4 feet long, and 1/4 inch thick are provided in the flight deck repair locker for this purpose. They would be laid over the damaged area and nailed in place with 4d wire nails.

Many holes in flight decks may be repaired by covering them with steel plates. Plates of various sizes should be provided. Plates to be used in repairing wood decks should have 5/16-inch holes drilled along the edges. These plates may be secured to wooden decks by using 60d nails which have been cut into two parts. Only the part bearing the head is used. The cut end of this part is flattened prior to use. Plates that are to be attached to metal flight decks must be welded. The edge(s) facing approaching aircraft in the landing area must be welded in a continuous bead to prevent the possibility of engagement of an aircraft arresting gear hook. The opposite edge (forward) can be tack welded unless additional strength is required due to the nature of the damaged area. In the latter situation, continuous bead welding is necessary.

Holes that cannot be covered with a single plate may be patched with a series of plates. Additional strength members (I-beams) must be added. When flight operations have been completed, the temporary patch can become a semipermanent one by welding an I-beam to the web of the new temporary deck beams and the permanent deck beams.

Detailed instructions for making temporary and semipermanent repairs are covered in chapter 9880, Section 3, NavShips Technical Manual, Stock Number 0901-883-0002.

Small cuts and gouges in wood flight decks that have splintered edges should be smoothed out using an adz. As an alternate to the use of wood or metal plates for temporary repairs of gouges to wood deck planking in the landing area, latex underlay may be utilized. This should be applied in accordance with instructions given in chapter 9140, Section 5, NavShips Technical Manual, Stock Number 0901-140-0002.

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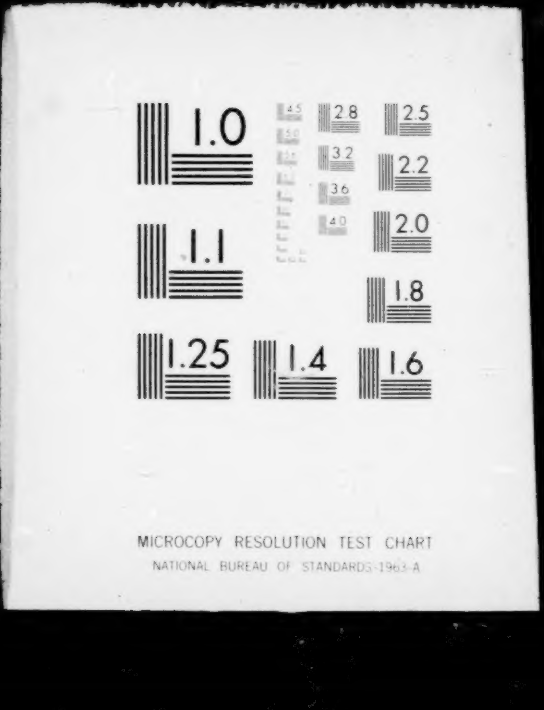
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CHAPTER 6

ADMINISTRATION

By definition a supervisor is one who is responsible for and directs the work of others. This means that the leading AB must actually oversee and instruct the men under his supervision. A mere inspection of the accomplished work is not supervision. The function of supervision is not considered to have been fulfilled until positive action has been taken to improve a program, to expedite a process, or otherwise improve a given situation. The supervisor has a tremendous responsibility when all facets are considered. He must satisfy the demands of his superiors, he must keep his men busy and content in their work, and as a check on himself, must constantly analyze his abilities in the job to determine if he is successfully accomplishing the goals of an instructor, leader, and administrator.

MANAGEMENT OF SHOP AND PERSONNEL

As an ABH1 or ABHC, you will have new supervisory duties which will require a greater knowledge and ability in administrative duties and procedures. The job of supervising is a many-sided task. It involves the procurement of equipment, repair parts, and other necessary materials; planning, scheduling, and directing work assignments; maintaining an adequate file of applicable references and technical manuals/publications; maintaining the required logs and records; making reports; and carrying on an effective and scheduled training program.

Some typical duties and responsibilities are as follows:

1. Getting the right man on the job.
2. Using and placing materials economically.
3. Preventing accidents and controlling hazards.
4. Keeping morale at a high pitch.
5. Maintaining quality and quantity of work accomplished.
6. Maintaining accurate and up-to-date records and reports.
7. Maintaining discipline.
8. Planning and scheduling work.
9. Procuring tools and equipment to do the work intended.
10. Giving orders, making decisions.
11. Checking and inspecting jobs of men.
12. Promoting good teamwork.

Some of the above techniques will have been learned through past experience; others will have to be learned during the actual supervision of the division. Still other techniques may be learned from self-study courses and technical publications. The purpose of this chapter is to acquaint the new supervisor with some of the more important aspects of supervision.

Briefly, the objectives of shop supervision are as follows:

1. To operate with maximum efficiency and safety.
2. To operate with minimum expense and waste.
3. To operate free from interruption and difficulty.

Personnel that are under your supervision most always be made aware of the dangers involved while working around the machinery or the aircraft aboard a carrier. They must move quickly, efficiently, and safely.

While these are the primary objectives of supervision, it is well for the ABH1 or ABHC who may be assigned these duties to keep in mind the fact that his assignment is important to him personally. It affords him an excellent opportunity to gain practical experience toward eventual advancement to ABCS and ABCM.

A supervisor should know his men's limitations and capabilities in order to get the most work out of them. He should utilize the capabilities of his best men in a twofold manner. If at all possible he should assign a well-qualified man to do a certain job and add to the team other individuals who are less qualified, but who are professionally ready for advanced on-the-job training.

The supervisor must anticipate the eventual loss of his most experienced workers through transfers, discharges, etc., and offset this by the establishment of an effective and continuing training program. In addition to raising the skill level of his division, the training program will insure that personnel, otherwise qualified, will be ready for the advancement examination.

A safety program must be organized and administered if the division is to function efficiently. Current Navy directives and local policies are quite specific as to the establishment of safety training programs. A worker is not much good to anyone if he is laid up in the sickbay.

The keeping of accurate and complete records is another factor in the efficient operation of a division. This includes records of usage data, work accomplished, and personnel progress. The most efficient recordkeeper is one who has enough records without having his files bulging with useless and outdated material.

The supervisor has responsibility for ordering and accounting for spare parts and material. He must impress upon his men the need for being thrifty in the use of these materials. The efficiency of any operation is directly related to the relative expense involved. There are many ways to economize, and the supervisor and his senior petty officers should always be on the alert for opportunities to point out these ways to the less experienced individuals.

Methods of avoiding waste and unnecessary expense should be included in the training program.

MAINTENANCE SHOP

A smooth running maintenance program depends largely upon the extent to which the maintenance shop files and equipment are maintained. Equipment in good working order, tools in good shape and of the proper type and quantity, and an up-to-date file of applicable publications are all important factors indicating a smoothly run maintenance shop.

The shop functions may be further smoothed by the judicious delegation of authority to individuals next in seniority to the supervisor. The delegation of authority does not relieve the supervisor of the final responsibility for work accomplishment. It is primarily a means of relieving the supervisor of details. A supervisor who allows himself to become too involved with details loses his effectiveness as a supervisor.

A system of stowing tools must be devised. An efficient system cannot be set up without first determining from allowance lists what tools will be required for satisfactory operation of the shop. The place for all tools should be marked or otherwise specified, and those not being used should be kept in that place.

The shop layout plan should make provisions for an information or bulletin board upon which may be posted safety posters, maintenance posters, instructions and notices, plans-of-the-day, and such other information as is appropriate from time to time. The bulletin board should be located in a prominent place in the shop, preferably near the entrance where everyone assigned will have to pass it at some time during the day. Material on the bulletin board should be changed frequently, expired notices promptly removed, the current plan-of-the-day posted early, and other posters and material rotated periodically. If the same material is presented in the same format every day, it will not be too long before the men begin to ignore the bulletin board and the purposes for having it will have been defeated. New arrangements are noticed and interest is stimulated with variety.

PERSONNEL WORK ASSIGNMENTS

Work assignments should be rotated so that each man will have an opportunity to develop his skills in all phases of the ABH work. When assignments are rotated, the work becomes more interesting for the men. Another good reason for rotating work assignments is that if one highly skilled man performs all the work of a certain type, the supervisor and the division would be at a great disadvantage in the event the man is transferred. Less experienced personnel should be assigned to work with him in order to become proficient in his particular skill. Also, to broaden his knowledge of his rate, the expert on one job should be rotated to other tasks. This will make him more valuable to his division and to the Navy in general.

Strikers should be assigned to various tasks so that they will acquire experience on all kinds of jobs. A special consideration for the assignment of strikers to jobs is that they should be assigned progressively to jobs of ascending levels of difficulty. A striker may be a useful assistant on a complicated job, but he may not understand what he is doing unless he has worked his way up from basic tasks.

ALLOWING FOR PLANNED INTERRUPTIONS

During an average workday, occasions will arise when personnel have to leave their working spaces for one reason or another, thereby delaying the completion of the scheduled work. Some delays can be anticipated; some cannot. Among the delays which can be anticipated are training lectures, immunization schedules, flight operations, rating examinations, meals, and watches or other military duties.

Before making personnel work assignments, the supervisor should determine what delays can be anticipated. It may be possible to arrange assignments so that work interruption is held to a minimum. When estimating the completion time of a maintenance task, the supervisor should allow for these predictable delays.

INSPECTION OF COMPLETED WORK

All work completed by the division is subject to inspection. This fact in no way relieves the supervisor of the responsibility for checking on the quality of work accomplished by his division. Frequent inspections should be made during the progress of the work as well as after completion. The supervisor's inspection should provide affirmative answers to the following questions:

1. Is the work being done according to current directives?
2. Do the materials used conform to specifications?
3. Is the job complete in all respects?
4. Does the workmanship measure up to desired standards?

SETTING UP SAFE WORKING CONDITIONS

Operational readiness of aircraft handling equipment, emergency gear, and firefighting gear is a prerequisite before and during flight operations. Keeping all machinery and/or equipment in "4.0" operating condition is the prime maintenance function of all personnel in the ABH rating. It is equally essential that this important maintenance be performed without injury to personnel or damage to equipment or aircraft, etc.

Maintenance is, to some extent, naturally hazardous due to the nature of the work, the equipment and tools involved, and the variety of materials required to perform many repairs and maintenance functions. Factors which can function to increase or decrease these hazards are (1) the experience levels and mental attitudes of assigned personnel, and (2) the quality of supervision of the maintenance tasks. Thorough indoctrination of new personnel and a continuing safety program are the most important steps in maintaining safe working conditions.

The concept of maintenance safety should extend beyond concern for injury to personnel and damage to equipment. Safe work habits go hand-in-hand with flight operation safety. Tools left adrift, improper torquing of fasteners, and poor housekeeping around machinery can cause conditions which may claim the lives of personnel as well as cause strike damage to aircraft. Safety in machinery spaces is equally as important as safety on the flight deck.

While the increased complexity of our modern equipment is a factor, it is noted that a large number of accidents and incidents are due, not to complexity of equipment, but to lack of supervision and technical knowledge. Many mistakes are simple ones in routine maintenance.

Safety in maintenance depends largely upon the supervisory personnel. The standards of quality which they establish are directly reflected in the quality of the preventive maintenance. The primary duty of the senior petty officers is to supervise and instruct others rather than to become totally engrossed in actual production. Attempts to perform both functions invariably result in inadequate supervision and greater chance of error. Supervisors must exercise mature judgment when assigning personnel to maintenance jobs. Consideration must be given to each man's experience, training, and ability.

Sometimes overlooked in a maintenance program are the considerations generally grouped under the term "human factors." These factors are important in that they determine if an individual is ready and physically able to do the work safely and with quality. Supervisory personnel should be constantly aware of conditions such as general health, physical and mental fatigue, unit and individual morale, training and experience levels of personnel, and other conditions which can contribute in varying degrees to unsafe work. Not only is it important that proper tools, protective clothing, and equipment are available for use, but also the insistence by maintenance supervisors that they are used is of utmost importance. For example, maintenance personnel are sometimes negligent in the wearing of sound attenuation devices in high noise areas.

Technical knowledge also plays a large part in a good maintenance safety program. The complexity of our modern equipment demands the attention of well-informed and expert maintenance personnel; otherwise, the machinery cannot be operated and maintained properly. Technical knowledge is a function of education and training which, incidentally, does not end with graduation from Class A school. Graduation is only the beginning. Any ABH worthy of the rating is continually training and learning through self-study and application, and through a personal desire for proficiency and self-betterment. Technical knowledge by itself is not sufficient unless it is coupled with an old-fashioned craftsmanship that receives gratification and keen satisfaction in doing any job well. The ABH who wishes to contribute to safety and reliability improvement must know his job and must develop professional pride in the quality of his work.

It is a continuing duty of every person connected with maintenance to try to discover and eliminate unsafe work practices. Accidents which are caused by such practices may not take place until a much later date and their severity cannot be predicted. The consequences may range from simple material failure to a major accident resulting in serious injuries or fatalities.

There are several areas in which the shop supervisor can effectively work to minimize accidents due to maintenance. Among these are continuing inspections of work areas, tools, and equipment; organization and administration of safety programs; correct interpretation of safety directives and precautions; and energetic and imaginative enforcement of them.

INSPECTION OF WORK AREAS, TOOLS, AND EQUIPMENT

Most accidents can be prevented if the full cooperation of ALL personnel is gained and vigilance is exercised to eliminate all unsafe acts. The supervisor should continually and diligently inspect work areas, assigned cleaning spaces, tools, and equipment to detect and correct potentially and/or hazardous and unsafe conditions. The ABH may be working in a shop, his assigned cleaning station, or on the flight deck—all of these areas should be included in the supervisor's inspection. He should check for explosion and inhalation hazards due to improper ventilation of working spaces in the event of careless and improper handling of materials.

Fire hazards present another serious problem; "NO SMOKING" rules must be strictly enforced. Spilled fuel, oil, grease, and chemicals must be wiped up promptly, and the rags used disposed of in approved containers or as directed by local regulations concerning flammables.

Handtools should be in good condition, of the proper type, and used only for the purpose intended.

Insure that equipment is operated only by qualified personnel, and that safety devices and/or guards are installed and in good condition. The equipment must also be inspected for broken or damaged components, and corrective action taken when required. Check to see that periodic maintenance, servicing, and/or inspections are up to date for that equipment requiring action.

ORGANIZATION AND ADMINISTRATION OF SAFETY PROGRAMS

In accordance with the Navy policy of conserving manpower and material, all naval activities are required to conduct effective and continuous accident prevention programs. The organization and administration of a safety program are part of the requirements of the supervisor. The safety program must be in accordance with local instructions and based on information contained in official United States Navy safety precautions. Work methods must be adopted which do not expose personnel unnecessarily to injury or occupational health hazards. Instructions in appropriate safety precautions are required and disciplinary action should be taken in cases of willful violations.

The shop safety program will generally involve three areas of attention—the posting of the most important safety precautions in appropriate places, the incorporation of safety lessons in the formal training program, and frequent checks for understanding during the day-to-day supervision of work.

Posted safety precautions are more effective if they may be easily complied with. For example, a sign on a tool grinder reads "goggles required," so one or more pairs of safety goggles should be hanging within reach at the machine. Similarly, the protective clothing poster in the shop should be backed up with readily available aprons, gloves, shields, etc.

Fixed posters and signs should be renewed frequently and not allowed to become rusty, faded, or covered with dust and dirt. General safety posters on bulletin boards and other places should be rotated often to stimulate interest.

The formal safety training sessions should utilize films, books, visual aids, or any other suitable technical material. The men should be told more than just what to do or what not to do. Each safety subject should be explained in detail. Causes of accidents and contributing factors should be reviewed and analyzed. Many good ideas for accident prevention have been developed in training sessions devoted to such analysis.

It may be well to mention the new man in the division at this point. A separate safety indoctrination lesson which covers all the major hazards of the work should be given to a new man as soon as he reports for work. No supervisor will expose the new man to air operations without pointing out the dangers involved.

In the third area of safety program administration—follow-up—the supervisor will do well to delegate authority to his subordinate petty officers to assist him in monitoring the program. Also included in the followup area is the responsibility of the supervisor to inquire as quickly and thoroughly as possible into the circumstances of accidents and reports of unsafe practices followed by appropriate action to correct any deficiencies uncovered.

SUPPLY

It is essential that the ABH1 and ABHC know certain phases of supply in order to procure and maintain equipments in accordance with current regulations. They must be familiar with the publications used in identifying material, equipment, and spare parts utilized in the performance of the duties of their rate. In addition, the ABH1 and ABHC must be familiar with the quantities of material and equipment authorized, and the authorization for these allowances. They must also know procedures used in procuring, expending, inventorying, and maintaining custody of material.

IDENTIFICATION OF SPARE PARTS AND EQUIPAGE

In order to procure the desired material or to properly conduct an inventory of materials on hand, the ABH must be able to identify the material or equipment concerned. The nameplate attached to some equipment furnishes data helpful in identifying the equipment. However, when procurement requests are initiated, it is very important that the correct federal stock number, complete nomenclature, part number, and reference be furnished the supply officer to prevent ordering unsuitable material. This information can normally be obtained from Navy stock lists and applicable technical manuals, parts lists, NavAirSysCom change bulletins, and allowance lists.

FLEET ORIENTED CONSOLIDATED STOCK LIST

The Fleet Oriented Consolidated Stock List (FOCSL) is prepared by the Navy Fleet Material Support Office and is designed to afford relief of workload for shipboard personnel. The many stock catalogs are impractical for shipboard use because they are bulky in size, they differ in format, they include much data never used aboard ship, and they require an excessive amount of time to maintain. The FOCSL was developed in order to substantially reduce the number of supply catalogs required to be maintained by reducing and tailoring catalog information to those items of interest to Navy personnel.

Prior to the development of the FOCSL, it was necessary to search through several cross-reference listings published by the various inventory managers to cross-reference a manufacturer's part number of a federal stock number. Part number for Navy interest items are now consolidated into the MASTER CROSS-REFERENCE LIST section of the FOCSL regardless of the controlling inventory manager. This section is a one-way listing from part numbers to Federal Item Identification Numbers (FIINs) and includes the federal supply code for manufacturers. The part numbers are arranged in alphanumerical sequence.

Bimonthly CHANGE BULLETINS are published to update the Price and Management Data section and the Master Cross-Reference List section; a separate bulletin is issued for each. These change bulletins are cumulative and list necessary current information to update the applicable FOCSL sections. The information is presented in the same format as the basic section.

CURRENT WEAPONS EQUIPMENT LIST (WEL 1090)

This List contains FSN (Federal Stock Number) to P/N (Part No.) and P/N to FSN cross-reference listings. This List is invaluable to the ABH.

NAVY STOCK LIST OF AVIATION SUPPLY OFFICE

The Navy Stock List of the Aviation Supply Office lists and identifies material under the inventory management of the Aviation Supply Office (ASO). This material is identified by the cognizance symbol E or R prefixing the federal stock number of the item. The Navy Stock List of ASO is published in four parts.

Cross-Reference C0009 (FSN to Manufacturer's Part Number and Code)

One part of the ASO stock list publication is a cross-reference from federal stock numbers to manufacturer's part numbers and code.

Price and Management Data Section

The second ASO stock list publication contains the following information: the federal stock number of the item, its unit price, unit of issue and accountability code; new items; and deleted items. All classes of material are included in these sections.

Descriptive Sections

The third ASO stock list publication contains a cross-reference from the characteristics of items to the federal stock numbers.

Parts List Sections

The fourth ASO stock list publication contains a cross-reference from part number to stock number, supersedure of numbers, additional model applications; equivalents, change of design information, maintenance and overhaul percentages, accountability codes, perishability and salvageability information, and indications as to whether items are included on allowance list.

REQUEST FOR ISSUE

The ABH may encounter a variety of local requisitioning channels, all designed to satisfy material requirements. Procedures at the consumer level are somewhat flexible. Normally, the single line item requisition, DD Form 1348, is the form on which material is procured from the supply department. It is important that the correct stock number, manufacturer's part number, and nomenclature be included on all requests in order to expedite identification and issue. Incorrect or omitted information can lead only to confusion and delay in issue, or possibly the wrong part or material may be issued.

Afloat, the request document is presented to the aviation stores division for technical aeronautical material or to the supply office for other than aeronautical material. While individual ships may employ different procedures, such as a credit card system, the DD Form 1348 is normally the request document. When it is necessary for the ABH to draw parts or material from supply, he prepares a DD Form 1348 and presents it to the air officer or his authorized representative for signature. The DD Form 1348 is then presented to the supply department for processing and receipt of material.

Ashore, the requisition may be presented directly to a supply warehouse or to an established retail issue outlet. Procedures may differ between shore stations, because of assigned levels of maintenance, geographical location of shops relative to supply facilities and other factors. Normally the DD Form 1348 is the proper request document which is prepared and submitted in accordance with local instructions.

REQUESTS FOR IN-EXCESS MATERIAL

Aboard ship requisitions for the following are considered as in-excess:

1. Equipage not on the ship's allowance list.
2. Equipage on the allowance list but in greater quantities than allowed.
3. Repair parts not listed with quantities in ship's allowances for which a request can be justified.

Request for in-excess material must be accompanied by a complete justification as to why the item is required and why authorized material will not suffice. If the item is required for use by all similar type activities, a recommendation should be made to include the item in an applicable allowance list. Except in an emergency, in-excess material cannot be issued by the supply officer until the request has been approved by competent authority.

Ashore, the ABH is not normally confronted with in-excess requirements. Accountable (plant account) material requirements are included in the activity's budget submission to the management bureau, and the granting of funds normally constitutes approval of the requirement.

REQUESTS FOR NONSTANDARD MATERIAL

Nonstandard material is material for which a federal stock number has not been assigned. When preparing a DD Form 1348 for nonstandard material, it is imperative that complete information be furnished in order that the supply officer may positively identify the exact material, equipment, or part that is required. The following information should be furnished, if possible, when requesting nonstandard material:

1. Complete name of item.
2. Complete nomenclature of item.
3. Manufacturer's name.
4. Manufacturer's part or drawing number.
5. Name and address of a dealer where the material can be obtained.
6. The document or publication authorizing issue of the item.
7. Justification as to why standard material will not suffice.

Requests for nonstandard material are prepared on DD Form 1348 and forwarded to the supply officer in the same manner as a request for standard material.

SURVEYS

The Survey Request, Report, and Expenditure (NavSup Form 154) is the document used to reevaluate or expend lost, damaged, deteriorated, or worn material from the records of the accountable officer as required by U. S. Navy Regulations. Rules and regulations governing surveys and the responsibility connected with the accounting for government property are of primary importance to every man in the naval service.

The survey request provides a record showing the cause, condition, responsibility, recommendation for disposition, and authority to expend material from the records. Rough survey requests are prepared by the person or department head responsible for the material to be expended or reevaluated.

TYPES OF SURVEYS

There are two types of surveys with which the ABH should be familiar—formal and informal. Each activity normally prepares local regulations outlining the circumstances which will determine whether a formal or informal survey will be made. However, the commanding officer will order a formal survey in any case he deems it necessary.

Formal Survey

A formal survey is required for those classes of materials or articles so designated by the bureau or office concerned, or when specifically directed by the commanding officer. A formal survey is made by either a commissioned officer or a board of three officers, one of whom, and as many as practicable, must be commissioned, appointed in either instance by the commanding officer.

Neither the commanding officer, the officer on whose records the material being surveyed is carried, nor the officer charged with the custody of the material being surveyed, may serve on a survey board.

Informal Survey

Informal surveys are made by the head of the department having custody of the material to be surveyed. Informal surveys are used in cases when a formal survey is not required or directed by the commanding officer.

PREPARATION OF A REQUEST FOR SURVEY

A request for survey may be originated by a department, division, or section head, or a designated subordinate, as prescribed by local regulations. Normally, requests for survey are originated in the department having custody of the material being surveyed. The initial survey is made on a rough copy of Form 154. A statement by the originator is placed on or attached to the request for survey. Included in this statement is information relative to the condition of material; cause or condition surrounding the loss, damage, deterioration, or obsolescence of material; responsibility for cause or condition of material, or reason why responsibility cannot be determined; and recommendation for disposition of material or action to be taken

Upon receipt of the rough copy, the designated group or section prepares a sufficient number of smooth copies of the request for distribution in accordance with local regulations. The smooth survey request is filled in down to the caption "Action by Commanding Officer or Delegate." It is then forwarded to the commanding officer who will determine whether the survey will be formal or informal. If formal, the survey request is forwarded to the designated surveying officer(s); if informal, it is forwarded to the HEAD of department for survey action.

The statement by the originator as to the cause, condition, etc., is attached to the smooth request for survey for evaluation by the surveying officer(s). After the survey has been completed by the head of department or surveying officer(s), it is returned to the commanding officer for review action. After approval by the commanding officer, the survey request is forwarded to the cognizant fleet command and/or bureau for final review and approval when so required. In the absence of specific instruction, surveys are not forwarded to the Naval Air Systems Command for final review and approval.

After approval, the supply officer expends items as directed by the approved survey.

Requests for replacement of surveyed items must be made with DD Form 1348, and must be accompanied by a certified copy of the approved survey request.

CULPABLE RESPONSIBILITY

When a person in the naval service is found to be culpably responsible by a surveying officer or board, the reviewing officer will refer the entire matter to such a person for a statement. The reviewing officer must then take such disciplinary action as the circumstances require. He will note on the survey the action taken and inform the Chief of Naval Personnel and the bureau concerned as to the disciplinary action taken. In the case of officers, he must make recommendations as to the inclusion of a statement of the action taken in the record of person concerned and inform that person of the final decision in the matter. Action on the survey in respect to the material involved must NOT, however, be withheld pending disciplinary action. (See art. 1953, U. S. Navy Regulations.)

INVENTORIES

In the first quarter of each fiscal year an annual inventory of equipage is conducted. The supply officer coordinates and sets up the beginning and ending annual inventory dates with the approval of the commanding officer. Each department is advised of these inventory dates in writing by the supply officer. It is the responsibility of each department head to inventory the equipage assigned to his department. ABH's are normally required to physically inventory all equipage assigned to them on a custody receipt from the air officer or their division officer. When equipage is inventoried, special care should be taken to note if it is serviceable, properly preserved and stowed, and to ascertain if it is still required by the department to perform its assigned mission. The using ABH is the person in the best position to determine this. Therefore, he should make recommendations to the division officer or to the air officer as to the need for survey, expenditure, disposition, or acquisition of additional equipage.

The most important inventory is the one held within the division. There is no answer in the event a certain spare part is needed and it suddenly comes to light that one is not available. Not one piece of equipment under the cognizance of ABH's can be allowed to be inoperative at any time. Therefore, if something is in a down status due to the lack of a proper inventory of spare parts, someone is in trouble; and as a senior ABH, there is no need to point out who it is.

To operate efficiently and to insure that spare parts are properly stowed and inspected, an inventory is held every 30 days. There should always be a 90-day supply of spare parts aboard; therefore, inspect your spares as often as necessary to see that you have a complete stock and that it is in good condition.

CUSTODY CARDS

Equipage is the term normally used to identify nonexpendable material for which custodial responsibility is designated by means of custody cards. An inventory count of equipage on hand must be brought into agreement with the amount shown on the custody cards. Any items missing at inventory, or found to be unserviceable, must be surveyed and expended from the custody record cards. Equipage, on which custody cards must be maintained, is defined as those items having an accountability code designation of D, E, R, or L. Code D and E items are maintained on a custodial signature basis. Code R and L items, depending on the use of the item, are in some cases maintained on a custodial basis. All of these four coded items are normally exchanged on an item-for-item basis. There are two designations of custody record cards, S. and A. Form 306 or 460. Figure 6-1 illustrates a typical custody card.

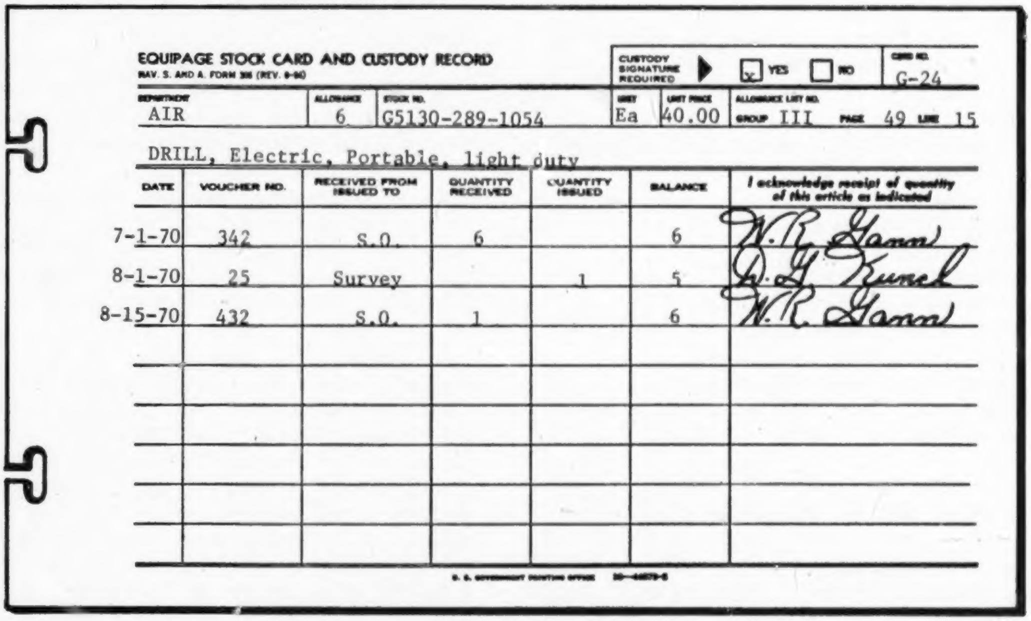
Equipage is issued by the supply officer to the head of the applicable using department. The department is held accountable to the commanding officer for this material. It is apparent that the head of a department cannot personally keep track of all equipage for which he is held accountable. Therefore, he must delegate custodial responsibility to the division officers and/or leading petty officers using or having the material in their custody. When an ABH is assigned custodial responsibility, he is required to sign a memorandum receipt to his division officer or department head for the material for which he is held responsible.

The ABH should keep strict control over and know the location of his equipment at all times. He can be held culpably responsible for material lost or damaged due to his negligence.

TECHNICAL PUBLICATIONS

Technical publications that the ABH need be knowledgeable of for use in conjunction with the operation, preoperational inspection, and normal maintenance of aircraft handling equipment are usually in the form of manual type publications. It is extremely important that senior petty officers be familiar with these publications to enable them to supervise the proper use, filing, procurement of needed manuals, and normal maintenance of these publications.

NavSup Publication 2002 is a 13-section index of all the forms and publications used throughout the Navy and stocked by the Naval Supply Systems Command. Section VI of this stock list is the basic index of the Naval Ships



EQUIPAGE STOCK CARD AND CUSTODY RECORD
NAV. S. AND A. FORM 306 (REV. 8-60)

CUSTODY SIGNATURE REQUIRED ☒ YES ☐ NO

CARD NO. G-24

DEPARTMENT	ALLOWANCE	STOCK NO.	UNIT	UNIT PRICE	ALLOWANCE LIST NO.
AIR	6	G5130-289-1054	Ea	40.00	GROUP III PAGE 49 LINE 15

DRILL, Electric, Portable, light duty

DATE	VOUCHER NO.	RECEIVED FROM ISSUED TO	QUANTITY RECEIVED	QUANTITY ISSUED	BALANCE	I acknowledge receipt of quantity of this article as indicated
7-1-70	342	S.O.	6		6	W. R. Gann
8-1-70	25	Survey		1	5	D. G. Kunel
8-15-70	432	S.O.	1		6	W. R. Gann

AB.328

Figure 6-1.—Custody Card.

System Command, and contains both alphabetical and numerical listings of all NavShips publications by stock number, title, security classification, and the date of the most recent issue. Section VI is further divided into four parts—I, II, III, and IV. Section I lists all NavShips publications in numerical order according to stock number. Section II lists the same publications in alphabetical order according to title/nomenclature.

Section VIII of this index contains Naval Air Systems Command publications, listed by publications code number, title, security classification, and the date of the latest issue. Section VIII is further divided into four parts—A, B, C, and D. Part C is the numerical listing of manual type publications, and part D contains listings of letter type publications. (Parts A and B contain listings of ordnance publications and normally are of no interest to the ABH.)

The technical manual type publication makes available information necessary for the proper operation and maintenance, and gives the safety precautions of the particular equipment about which it is written. Publications of this type serve as a reference for operating, maintaining, and correcting the malfunctions of the equipment. They may also serve as textbooks for operating personnel to study optimum procedures of operation and maintenance established by past experiments and experiences. New and recently revised manuals do not contain detailed descriptions or procedures concerning preventive maintenance since this information is now contained on the 3-M Maintenance Requirements Cards (MCR's). Technical manuals do contain the following:

1. Description of equipment.
2. Theory of operation.
3. Troubleshooting techniques.
4. Corrective maintenance information.
5. Specific safety information.
6. Parts breakdown and numbers.
7. Sketches, diagrams, schematics, operating and design limits, etc.

PROCUREMENT OF PUBLICATIONS

Manual type publications may be obtained by properly preparing and submitting DOD Single Line Item Requisition System Document (DD Form 1348 or 1348m) to the nearest supply point (indicated on the inside front cover of NavSup Publication 2002, Section VIII, Part C). List the publications code number, federal stock number, and title of each manual desired.

Letter type publications should be ordered using DD Form 1149, in accordance with the instructions given on the cover page of NavSup 2002, Section VIII, Part D.

Requests to be placed on the mailing list for NavSup 2002, Section VIII, Parts C and D, and supplements should be submitted to NATSF, 700 Robbins Avenue, Philadelphia, Pennsylvania 19111. NavSup 2002 is revised and reissued semiannually. During the interval between issues, supplements are issued containing listings of publications distributed or canceled since the last issue.

MAINTENANCE AND FILING OF PUBLICATIONS

There are four mandatory requirements to be met in maintaining an allowance of publications. These requirements are as follows:

1. That the prescribed publications be on board.
2. That the publication be corrected up-to-date.
3. That they be ready for immediate use.
4. That applicable security provisions be observed.

Most changes to publications are issued either in the form of looseleaf pages, pen-and-ink changes, or complete revisions. When changes are issued in the form of numbered pages, the old page with the corresponding number is removed and the new replacement page inserted in its place. Specific instructions are normally given with each change on the method to be used in incorporating the change. Changes should be made immediately upon receipt.

A checklist of pages that are to remain in the publication after the change has been incorporated is provided with changes issued for some publications. This checklist should be compared against pages remaining in the publication to insure they agree. Extra pages are removed and missing pages ordered to bring the publication up to date. Obsolete pages removed should be secured together and retained until the next change is received. Sometimes the wrong pages are removed from a publication when a change is entered and the error is not discovered, even with the checklist, until the next change is entered.

When pen-and-ink changes are made, the change number and date should be entered with each change for future reference. Sometimes it is convenient to cut out pen-and-ink changes and insert them in their proper place in a publication by fastening them with a transparent tape or mucilage.

RECORDS, REPORTS, AND SCHEDULES

The records, reports, and schedules discussed in this section are a selection of some of the more important that senior petty officers will encounter in their billets as leading petty officer, supervisor, and/or leader. When preparing any report/schedule, etc., bear in mind that it should be as accurate and complete as possible, whether it is prepared personally or under your direction. In either case it is a personal reflection on you as a petty officer.

UNSATISFACTORY MATERIAL/CONDITION REPORT

The Unsatisfactory Material/Condition Report (UR) was created to obtain service experience information from the most reliable sources. The major aspects of the program are the collecting, compiling, and analyzing of service experience with aeronautical materials to determine areas of immediate failures and trends of impending failures, and to coordinate efforts to correct material deficiencies and improve flight safety, operational utility, and logistic support for operating aircraft.

The rapid collection and dissemination of service experience data to cognizant governmental activities are necessary in order to rapidly initiate appropriate action to insure more reliable equipment in fleet service. In this regard, the assignment of competent personnel to supervise and review Unsatisfactory Material/Condition Report preparation is mandatory.

The basic form used for reporting failures, deficiencies, or malfunctions of equipment is the Unsatisfactory Material/Condition Report (UR), OpNav 4790/47. (See fig. 6-2.)

The UR provides for submittal of specific information considered essential to conduct a complete evaluation and analysis of problem areas associated with catapults or arresting gear. The UR is required in order that complete statistical data and records concerning unsatisfactory material and failures may be compiled and appropriate corrective action taken. The reports include sudden failures (broken parts, etc.) as well as gradual failures (due to corrosion, foreign particles, stress, cracks, etc.). Conscientious reporting and the submission of detailed opinions and observations on failed or unsatisfactory items from the service will greatly help to process this data.

The UR form has provision for the originator to submit a report in various categories. Space 5 of the UR must indicate the category as determined by the reporting activity. Guides for this selection are as follows:

1. SPECIAL—indicates that the particular condition is a result of discrepancies in design, maintenance, technical data, quality control (new manufacture or overhaul), or foreign object damage, but was not itself critical in nature. Other special situations, such as not meeting expected performance life or other parameters which require reporting, fall into this category.

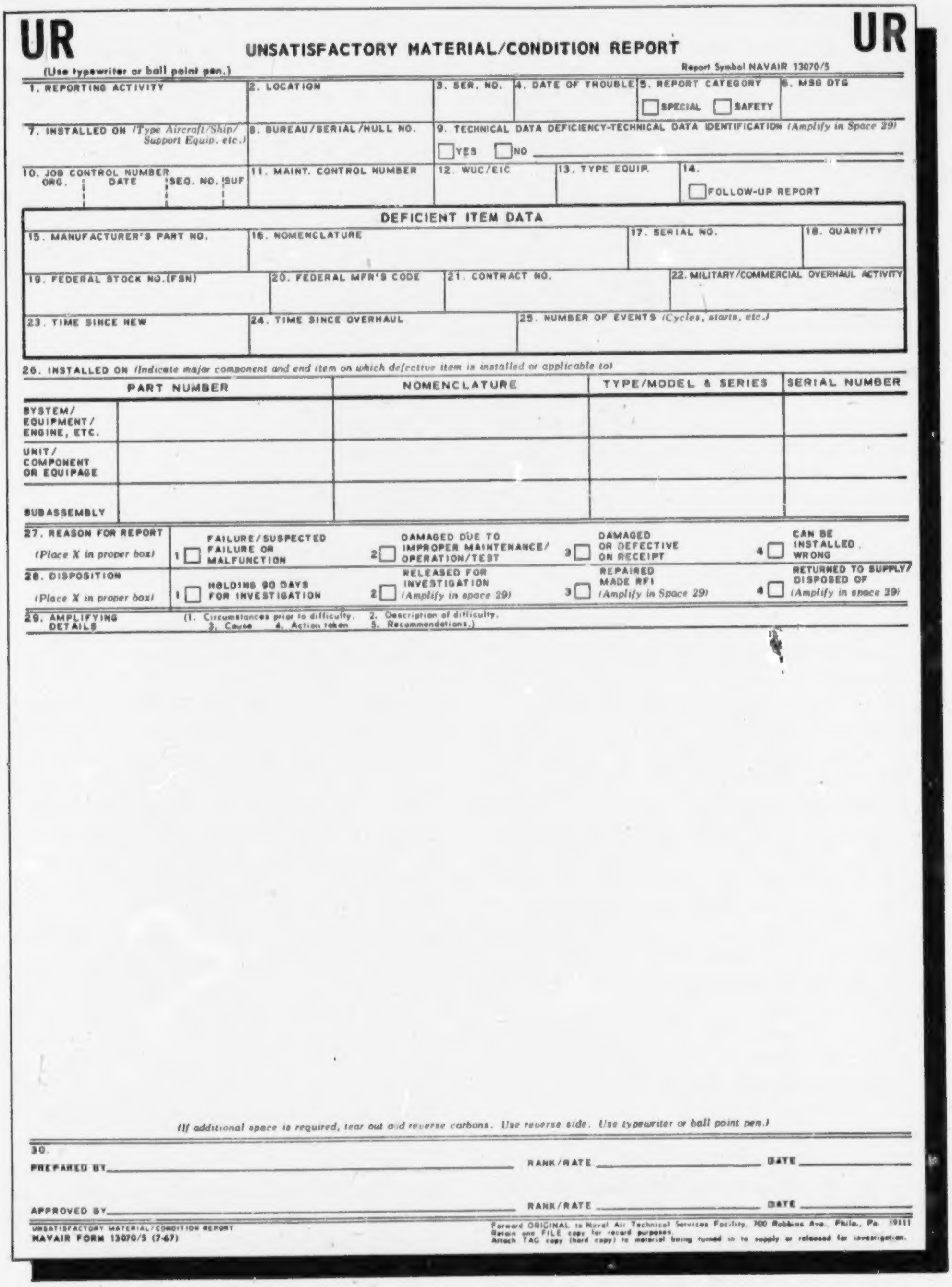
2. SAFETY--indicates a priority over all other reports. The originator selects this category when reporting deficient material conditions which, if not corrected, would result in fatal or serious injury to personnel or extensive damage or destruction to equipment; or for conditions that contribute to or could contribute to an accident or incident. A SAFETY Unsatisfactory Material/Condition Message should be initiated on the date the trouble occurs. The message must be assigned a "priority" rating. The SAFETY UR message must be followed up by a SAFETY UR.

The UR is provided in a carbon backed three-page set. To obtain legible copies, it is recommended that either uppercase letters on a typewriter or a ball-point pen be used.

The instructions for preparation of the Unsatisfactory Material/Condition Report (UR), printed on the first page of the three-page UR set, must be followed completely. Read all instructions thoroughly before filling in the UR.

The UR set is prepared in all cases when an accountable part is removed and replaced by a part drawn from supply, or when a part is delivered to a supporting maintenance activity for repair or replacement. The purpose of each section is as follows:

1. The first sheet in the set is the ORIGINAL document which is transmitted to the UR Center, NATSF (MR). Pertinent data from the UR is entered on the other parts of the UR set by carbon registration.



UR UNSATISFACTORY MATERIAL/CONDITION REPORT **UR**

(Use typewriter or ball point pen.)

Report Symbol NAVAIR 13070/5

1. REPORTING ACTIVITY	2. LOCATION	3. SER. NO.	4. DATE OF TROUBLE	5. REPORT CATEGORY ☐ SPECIAL ☐ SAFETY	6. MSG DTG

7. INSTALLED ON *(Type Aircraft/Ship/ Support Equip. etc.)*	8. BUREAU/SERIAL/HULL NO.	9. TECHNICAL DATA DEFICIENCY-TECHNICAL DATA IDENTIFICATION *(Amplify in Space 29)* ☐ YES ☐ NO ______

10. JOB CONTROL NUMBER ORG. ¦ DATE ¦ SEQ. NO. ¦ SUF	11. MAINT. CONTROL NUMBER	12. WUC/EIC	13. TYPE EQUIP.	14. ☐ FOLLOW-UP REPORT

DEFICIENT ITEM DATA

15. MANUFACTURER'S PART NO.	16. NOMENCLATURE	17. SERIAL NO.	18. QUANTITY
19. FEDERAL STOCK NO. (FSN)	20. FEDERAL MFR'S CODE	21. CONTRACT NO.	22. MILITARY/COMMERCIAL OVERHAUL ACTIVITY
23. TIME SINCE NEW	24. TIME SINCE OVERHAUL	25. NUMBER OF EVENTS *(Cycles, starts, etc.)*	

26. INSTALLED ON *(Indicate major component and end item on which defective item is installed or applicable to)*

	PART NUMBER	NOMENCLATURE	TYPE/MODEL & SERIES	SERIAL NUMBER
SYSTEM/ EQUIPMENT/ ENGINE, ETC.				
UNIT/ COMPONENT OR EQUIPAGE				
SUBASSEMBLY				

27. REASON FOR REPORT *(Place X in proper box)*	1 ☐ FAILURE/SUSPECTED FAILURE OR MALFUNCTION	2 ☐ DAMAGED DUE TO IMPROPER MAINTENANCE/ OPERATION/TEST	3 ☐ DAMAGED OR DEFECTIVE ON RECEIPT	4 ☐ CAN BE INSTALLED WRONG
28. DISPOSITION *(Place X in proper box)*	1 ☐ HOLDING 90 DAYS FOR INVESTIGATION	2 ☐ RELEASED FOR INVESTIGATION *(Amplify in space 29)*	3 ☐ REPAIRED MADE RFI *(Amplify in Space 29)*	4 ☐ RETURNED TO SUPPLY/ DISPOSED OF *(Amplify in space 29)*

29. AMPLIFYING DETAILS (1. Circumstances prior to difficulty. 2. Description of difficulty. 3. Cause 4. Action taken 5. Recommendations.)

(If additional space is required, tear out and reverse carbons. Use reverse side. Use typewriter or ball point pen.)

30.

PREPARED BY ______ RANK/RATE ______ DATE ______

APPROVED BY ______ RANK/RATE ______ DATE ______

UNSATISFACTORY MATERIAL/CONDITION REPORT
NAVAIR FORM 13070/5 (7-67)

Forward ORIGINAL to Naval Air Technical Services Facility, 700 Robbins Ave., Phila., Pa. 19111
Retain one FILE copy for record purposes.
Attach TAG copy (hard copy) to material being turned in to supply or released for investigation.

AB.322

Figure 6-2.—UR Form.

2. The FILE copy is retained by the UR report originator for record purposes. A file copy should be retained for 6 months by the reporting activity or the supporting maintenance activity, as appropriate.

3. The TAG copy (hard copy) is a complete carbon copy of the UR that is attached to material being turned in to supply or released for investigation.

Failed material should be retained at the field site with a legible TAG copy (hard copy) of the UR report securely attached to it. ALL ORIGINAL UR's or first sheet of UR sets, with photographs and/or drawings, are forwarded to the Naval Air Technical Services Facility (MR), 700 Robbins Avenue, Philadelphia, Pennsylvania 19111.

WORK AND MAINTENANCE LOGS

Daily work and/or maintenance logs may be kept to be used as sources of information in the preparation of MDCS documents. It is suggested that a logbook be kept for each work center and reviewed at regular intervals to ascertain that all pertinent information has been documented. A logbook suitable for this purpose may be requisitioned from General Services Administration (GSA) under federal stock number 7530-222-3525. This is a ledger type book with a hard cover binder and ruled pages.

OPNAV FORM 4790-2K

The Maintenance Data Collection system (MDCS) brought about several changes in Navy paperwork, one of these being a basic MDCS document, OpNav 4790-2K. Form 4790-2K is used for reporting various types of maintenance actions.

To provide the information required by MDCS, the OpNav 4790 Series documents must be completed, as appropriate, for each reportable maintenance action. Instructions for completing these forms are given in chapter 4 of the current issue of OpNav 43-P2 (3-M Manual) and in chapter 13 of Military Requirements for PO 3 & 2, NavPers 10056-C. A block by block description is given for each application or use of a particular form. Blocks (data elements) which are not documented for the particular application being described are not mentioned in that section of the manuals, and are to be left blank. It is mandatory that all applicable blocks on the forms be filled in correctly, to avoid rejection during automatic data processing (ADP) and to insure accurate information for the ship's CSMP and maintenance history.

Form 4790-2K is a single sheet, multipurpose form printed on NCR (no carbon required) paper. Form 4790-2K is used to report certain completed maintenance actions and the requirement for maintenance assistance (work request). (See fig. 6-3.)

The following is a brief description of the basic MDCS Form (4790-2K) by the sections (data element blocks) printed on this form:

Section I—Filled in for all maintenance actions (block #11 is used only for maintenance actions pertaining to an alteration, field change, etc.).

Section II—(Completed Action). Filled in following completion of a maintenance action, deferral, or work request.

Section III— (Deferral Action Planning). Filled in when maintenance action cannot be completed in the normal time for that job.

Section IV—(Remarks/Description). Record complete noun name of item.

Section V—(Remarks/Description). Will normally contain narrative data on all completed maintenance actions, deferrals, and work requests. Additional entries in this section may be directed by proper authority.

Section VI—(Supplementary Information). Used for repair activity planning, scheduling, and control of work.

The following is a brief description of the uses of the 4790-2K:

1. Completed Maintenance Actions. Appropriate blocks of a SINGLE sheet of the 4790-2K are filled in to record the following actions which have been performed at the Organizational level:

a. All reportable corrective maintenance.

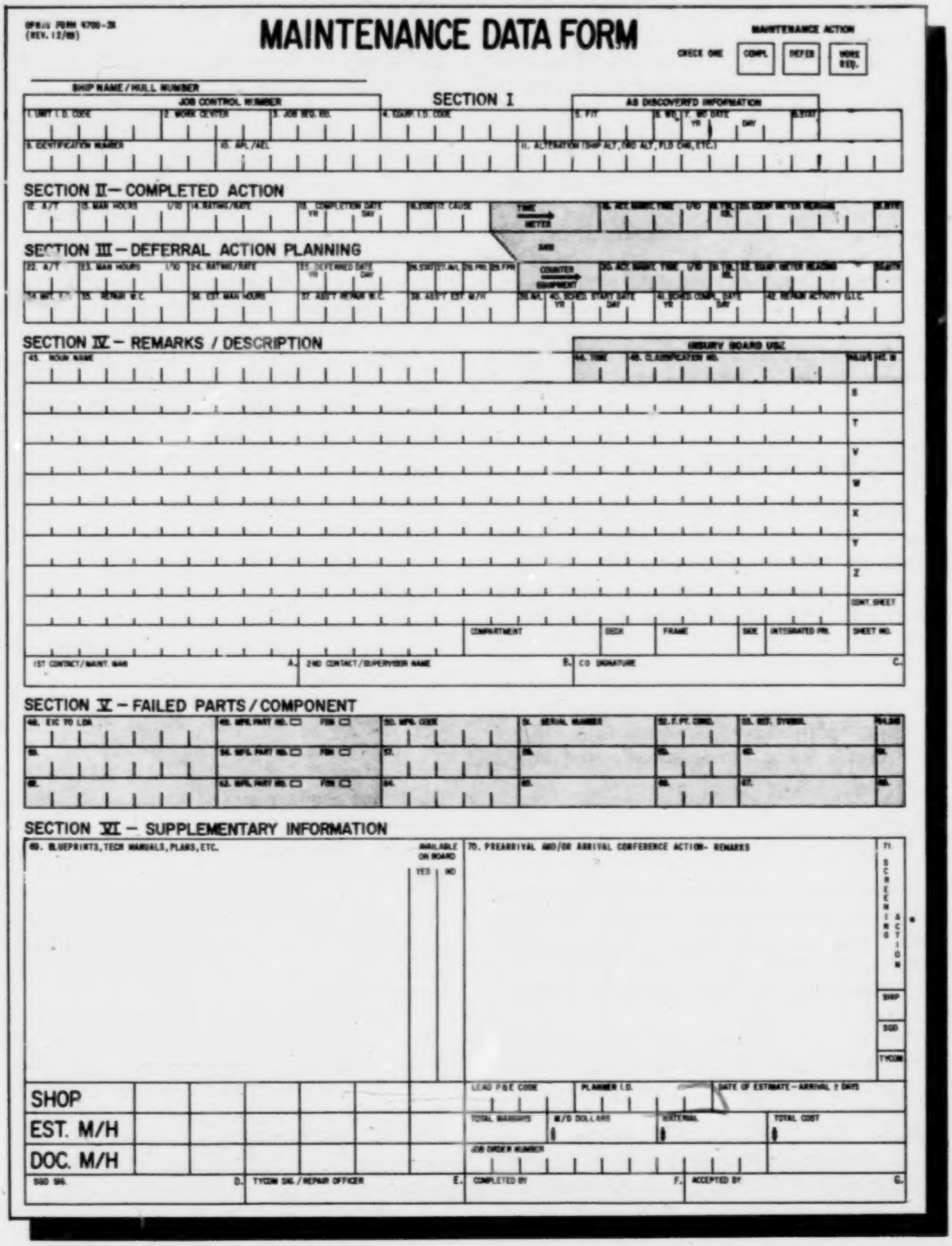
b. Authorized alterations which are completed without having first been deferred.

c. PMS actions for which the MRC specifies the use of repair parts or material.

d. PMS actions which require that meter readings be reported as part of the MRC procedures.

e. PMS actions during which clearances, tolerances, or readings are obtained which must be reported in accordance with Type Commander directives.

f. Preventive maintenance actions which are other than PMS.



MAINTENANCE DATA FORM

MAINTENANCE ACTION

CHECK ONE ☐ COMPL. ☐ DEFER ☐ MORE REQ.

SHIP NAME / HULL NUMBER

SECTION I

JOB CONTROL NUMBER

AS DISCOVERED INFORMATION

1. UNIT I.D. CODE
2. WORK CENTER
3. JOB SEQ. NO.
4. EQUIP. I.D. CODE

9. IDENTIFICATION NUMBER

10. APL/AEL

11. ALTERATION (SHIP ALT, ORD ALT, FLD CHG, ETC.)

SECTION II — COMPLETED ACTION

12. A/T
13. MAN HOURS
14. RATING/RATE
15. COMPLETION DATE YR DAY

17. CAUSE

TIME → METER

SECTION III — DEFERRAL ACTION PLANNING

22. A/T
23. MAN HOURS
24. RATING/RATE
25. DEFERRED DATE YR DAY

COUNTER → EQUIPMENT

35. REPAIR W.C.
36. EST. MAN HOURS
37. ASS'T REPAIR W.C.
38. ASS'T EST. M/H

40. SCHED. START DATE YR DAY
41. SCHED. COMPL. DATE YR DAY
42. REPAIR ACTIVITY U.I.C.

SECTION IV — REMARKS / DESCRIPTION

INSURV BOARD USE

43. NOUN NAME

44. TYPE
45. CLASSIFICATION NO.

S

T

V

W

X

Y

Z

CONT. SHEET

COMPARTMENT

DECK

FRAME

SIDE

INTEGRATED PR.

SHEET NO.

1ST CONTACT/MAINT. MAN A.

2ND CONTACT/SUPERVISOR NAME B.

CO SIGNATURE C.

SECTION V — FAILED PARTS / COMPONENT

48. EIC TO LOA
49. MFG. PART NO. ☐ FSN ☐
50. MFG. CODE
51. SERIAL NUMBER
53. REF. SYMBOL

56. MFG. PART NO. ☐ FSN ☐

57.

60.

63. MFG. PART NO. ☐ FSN ☐

67.

SECTION VI — SUPPLEMENTARY INFORMATION

69. BLUEPRINTS, TECH MANUALS, PLANS, ETC.

AVAILABLE ON BOARD

YES | NO

70. PREARRIVAL AND/OR ARRIVAL CONFERENCE ACTION- REMARKS

71. SCREENING ACTION

SHIP

SQD

TYCOM

SHOP						
EST. M/H						
DOC. M/H						

LEAD P&E CODE

PLANNER I.D.

DATE OF ESTIMATE — ARRIVAL 2 DAYS

TOTAL MANHOURS

M/D DOLLARS $

MATERIAL $

TOTAL COST $

JOB ORDER NUMBER

SQD SIG. D.

TYCOM SIG./REPAIR OFFICER E.

COMPLETED BY F.

ACCEPTED BY G.

AB.602

Figure 6-3.—OpNav Form 4790-2K.

NOTE: Except as specified above, the 4790-2K is not used to report routine maintenance accomplishment of PMS.

2. Deferred Maintenance Action. Appropriate blocks on TWO sheets of the 4790-2K are filled into record maintenance actions which cannot be completed within the time normally required for such maintenance actions. The initial documentation is completed and the copy submitted as soon as the need to defer required maintenance is recognized by a delay in starting, or a delay in completion, for any of the below listed reasons. The original of the deferral is retained on board for subsequent documentation of additional data and submission after the deferred maintenance has been completed, or it is desired to cancel the reported deferral. Deferred action reports are submitted for reportable maintenance which falls in the following categories:

a. Cannot be accomplished because of ship's operations. (In this respect, ship's operations are considered to include both in port and at sea activities which preclude accomplishment of required maintenance.)

b. Cannot be accomplished because of lack of parts or material.

c. Cannot be accomplished because of a need for technical skills or equipment not available on board. (Outside assistance required.)

d. All PMS actions (monthly and less frequent) that must be deferred for outside assistance to accomplish are reported as a deferred maintenance action.

NOTE: Where circumstances and ADP (Automatic Data Processing) facilities permit, it is intended that deferral action documents will provide the information required for automated generation of ship's work requests at the TYCOM ADP facility. Therefore, it is extremely important to insure that the information contained in section IV (Remarks/Description) of the deferral is accurate and complete enough to permit production of a meaningful work request.

3. Work Request. Appropriate blocks on FOUR sheets of the 4790-2K are filled in to record the need for outside assistance. Variations, however, from this standard number of copies may be required by certain repair activities. These procedures are also intended to accommodate those activities desiring to use the internal work request concept for planning and controlling maintenance assistance between work centers within the activity. Basic information for initiating the work request normally will come from the ship's copy of an associated deferral document.

NOTE: The work request is primarily intended for requesting assistance in accomplishing maintenance actions, but it is also used to request services or assistance not directly related to maintenance.

FORM 4790-2L, SUPPLEMENTAL REPORT FORM.—The 4790-2L is a single sheet, multipurpose form printed on NCR (no carbon required) paper. It is used to report feedback information and as the reporting form for certain special maintenance data collection programs. The number of documents required and the circumstances under which they are used are briefly discussed in the following paragraphs.

The following is a brief summary of the sections printed in the 4790-2L Form:

Section I—Filled in the same as on associated 4790-2K or 4790-2L is being used as a continuation sheet. Otherwise, only date and serial number need be completed.

Section II—Filled in as desired on voluntary report (comments, sketches, technical data, etc.). Filled in according to special instructions for mandatory submission.

Section III—For signature as indicated, or as directed for special report.

Section IV—Reserved for SPECIAL REPORTING PROGRAMS only. Filled in according to instructions.

Section V—For addressing, use as indicated, unless otherwise directed for special reporting.

The following is a brief description of the uses of the 4790-2L Form:

1. Voluntary Submission. Appropriate sections on FOUR sheets of the 4790-2L are filled in for submitting voluntary comments or questions related to maintenance actions, or to the MDCS. The report may be an initial report, not related to any other MDCS submission, or it may be a continuation sheet for a report, comment, or question previously submitted on either the 4790-2K or 4790-2L.

2. Mandatory Submission. The number of sheets required by the reporting program initiating activity are completed in accordance with the promulgated special instructions. Special reporting programs may require the use of an overprinted or slightly modified 4790-2L.

CYCLE SCHEDULES

The cycle schedule for any particular ship is a visual display of all planned maintenance actions (except daily and weekly), by items of equipment and for the quarter in which the action is to be performed. The period covered by the cycle schedule is from the END of overhaul period through the end of the next overhaul for for ship. A cycle schedule is prepared for each individual maintenance group in the ship, thus permitting equalization of the maintenance workload for each group.

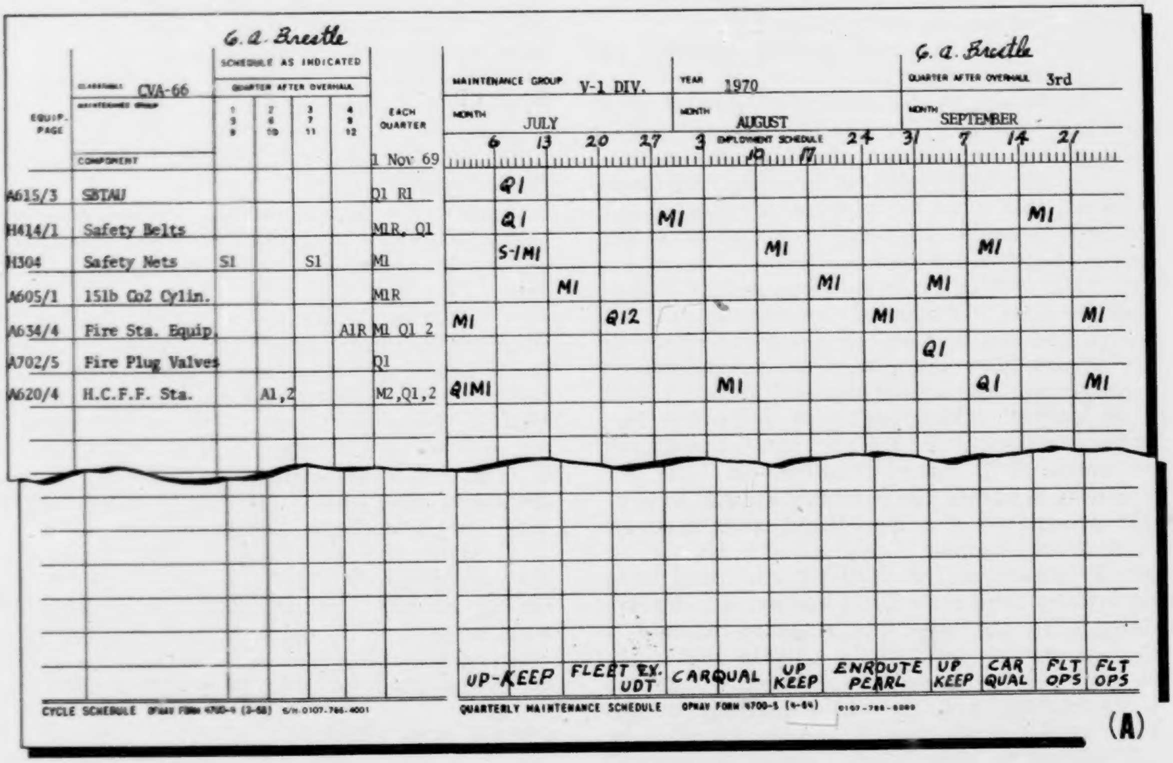
The cycle schedule is used by supervisory personnel to schedule the required preventive maintenance actions for a long-range schedule each quarter. Utmost emphasis must be exercised in the care and attention devoted to the preparation of the cycle schedule. The distribution of the preventive maintenance actions throughout the cycle have a direct effect on the ability of personnel to develop a reasonable and workable quarterly schedule, and if done properly can result in fewer changes to the quarterly schedule after its initial preparation and posting.

Quarterly Schedule

Preparing the quarterly schedule of preventive maintenance is one of the more important tasks in the 3-M/MDCS System. The quarterly schedule is prepared under the direction of the department head, by the division officer, division chief petty officer, leading petty officer, and the maintenance group petty officers.

The following steps should be used as a guideline for preparing the quarterly schedule of preventive maintenance (fig. 6-4 (A)):

1. Use form 4700/5 or /9 as applicable, and enter the name of the maintenance group concerned in the space provided.
2. Enter the calendar year of the quarter for which this schedule is being prepared.
3. Enter the months of the quarter for which this schedule is being prepared, and enter the appropriate QUARTER AFTER OVERHAUL number.



G. A. Brestle

CLASS/HULL CVA-66

MAINTENANCE GROUP

SCHEDULE AS INDICATED

G. A. Brestle

MAINTENANCE GROUP V-1 DIV.

YEAR 1970

QUARTER AFTER OVERHAUL 3rd

MONTH JULY

MONTH AUGUST

MONTH SEPTEMBER

EMPLOYMENT SCHEDULE

EQUIP. PAGE	COMPONENT	QUARTER AFTER OVERHAUL 1 5 9	2 6 10	3 7 11	4 8 12	EACH QUARTER 1 Nov 69		6	13	20	27	3	10	17	24	31	7	14	21
A615/3	SBTAU					Q1 R1		Q1											
H414/1	Safety Belts					M1R, Q1		Q1			M1							M1	
H304	Safety Nets	S1		S1		M1		S-1M1					M1				M1		
A605/1	15lb Co2 Cylin.					M1R			M1					M1		M1			
A634/4	Fire Sta. Equip.				A1R	M1 Q1 2	M1			Q12					M1				M1
A702/5	Fire Plug Valves					Q1										Q1			
A620/4	H.C.F.F. Sta.		A1,2			M2,Q1,2	Q1M1					M1					Q1		M1
							UP-KEEP		FLEET EX. UDT		CARQUAL		UP KEEP	ENROUTE PEARL		UP KEEP	CAR QUAL	FLT OPS	FLT OPS

CYCLE SCHEDULE OPNAV FORM 4700-4 (3-68) S/N 0107-766-4001

QUARTERLY MAINTENANCE SCHEDULE OPNAV FORM 4700-5 (4-64) 0107-766-6001

(A)

AB.603

Figure 6-4.—(A) Cycle and quarterly schedules of preventive maintenance.

4. The main body of the quarterly schedule is divided into 13 columns, each column representing a week. Each column is further divided into days by "tick" marks across the top of the columns. Using a calendar, write directly over the first "tick" mark of each week the date of each Monday as it appears on the calendar.

5. Using the ship's deployment schedule, proceed as follows:

a. Across the bottom line of the current quarterly schedule, write in the type of deployment corresponding with the dates indicated across the top of the columns. (UPKEEP, ASW, etc.)

6. Shade in the days to be underway lightly at the top of the column.

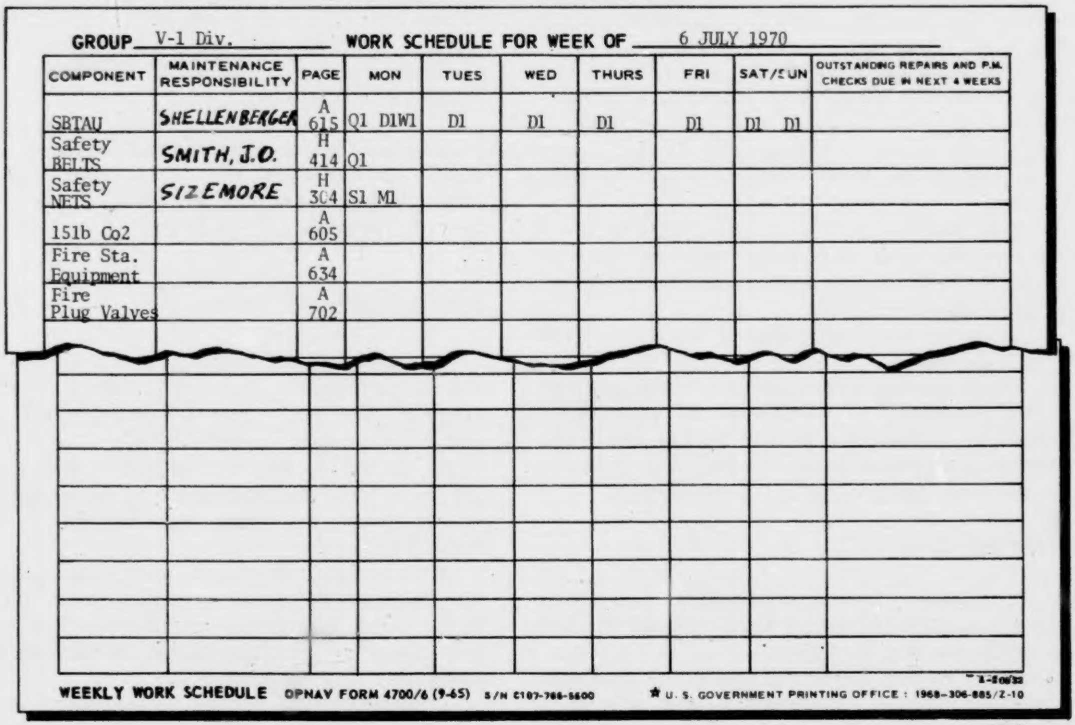
7. Place the cycle schedule beside the current quarterly schedule.

8. From the cycle schedule, select the QUARTERS AFTER OVERHAUL column corresponding to the current quarter. This column and the column headed EACH QUARTER are used in filling out the current quarterly schedule. The other columns on the cycle schedule are not used in the preparation of the current quarterly schedule.

9. Use the MRC's to determine the maintenance action required by the maintenance requirement numbers on the cycle schedule. Determine if the maintenance action can be performed in port or at sea. Schedule the requirement in the week in which the maintenance action is expected to be accomplished. Check each MRC for related maintenance requirements. If a related maintenance requirement is due in the same quarter, it should be scheduled in the same week.

10. Schedule only those cycle (C) requirements for which the number in parentheses matches the quarter being scheduled.

11. Insure that monthly requirements appear each month on the quarterly schedule. The group supervisor should try to schedule the workload as evenly as possible considering the ship's operations and outside influences on available time for performing preventive maintenance.



GROUP V-1 Div. WORK SCHEDULE FOR WEEK OF 6 JULY 1970

COMPONENT	MAINTENANCE RESPONSIBILITY	PAGE	MON	TUES	WED	THURS	FRI	SAT/SUN	OUTSTANDING REPAIRS AND P.M. CHECKS DUE IN NEXT 4 WEEKS
SBTAU	SHELLENBERGER	A 615	Q1 D1W1	D1	D1	D1	D1	D1 D1	
Safety BELTS	SMITH, J.O.	H 414	Q1						
Safety NETS	SIZEMORE	H 304	S1 M1						
15lb Co2		A 605							
Fire Sta. Equipment		A 634							
Fire Plug Valves		A 702							

WEEKLY WORK SCHEDULE OPNAV FORM 4700/6 (9-65) S/N C107-766-5600 ★ U. S. GOVERNMENT PRINTING OFFICE : 1968-306-885/Z-10

(B)

AB.604

Figure 6-4.—(B) Weekly schedule of preventive maintenance.

Quarterly schedules should be used as follows:

1. At the end of each week, the maintenance group supervisor should cross out all maintenance requirements that have been accomplished by referring to the last weekly schedule, and circle all requirements which have not been accomplished. All circled requirements must be rescheduled.
2. Subsequent quarterly schedules are placed to the right of the current quarterly schedule to provide continuity (i.e., rescheduling S, A, and C requirements).
3. The weekly schedule (fig. 6-4 (B)) is used to update the current quarterly schedule each week; this task is a key point in the system. Because the quarterly schedule is flexible, rescheduling is easily accomplished to accommodate the employment schedule changes which can and will occur.
4. Any semiannual, annual, or overhaul cycle requirement which cannot be accomplished during the current quarter will be rescheduled, on the subsequent quarterly schedule, and listed on the back of the current schedule, giving reason.
5. The completed quarterly schedule is removed from its holder and retained as a preventive maintenance record after the close of the quarter. Each schedule may be discarded at the end of the same quarter after the next overhaul.
6. The subsequent quarterly schedule is moved to the left becoming the new current quarterly schedule and a new subsequent quarterly schedule is posted.
7. Ships in overhaul should continue PMS where possible.
8. Ships leaving overhaul late in the quarter are not expected to complete all preventive maintenance scheduled during that quarter, but should accomplish a proportionate share based upon the time remaining in the quarter.

Weekly Schedule

To prepare a weekly schedule of preventive maintenance, the following steps should be used as a guideline (fig. 6-4 (B)):

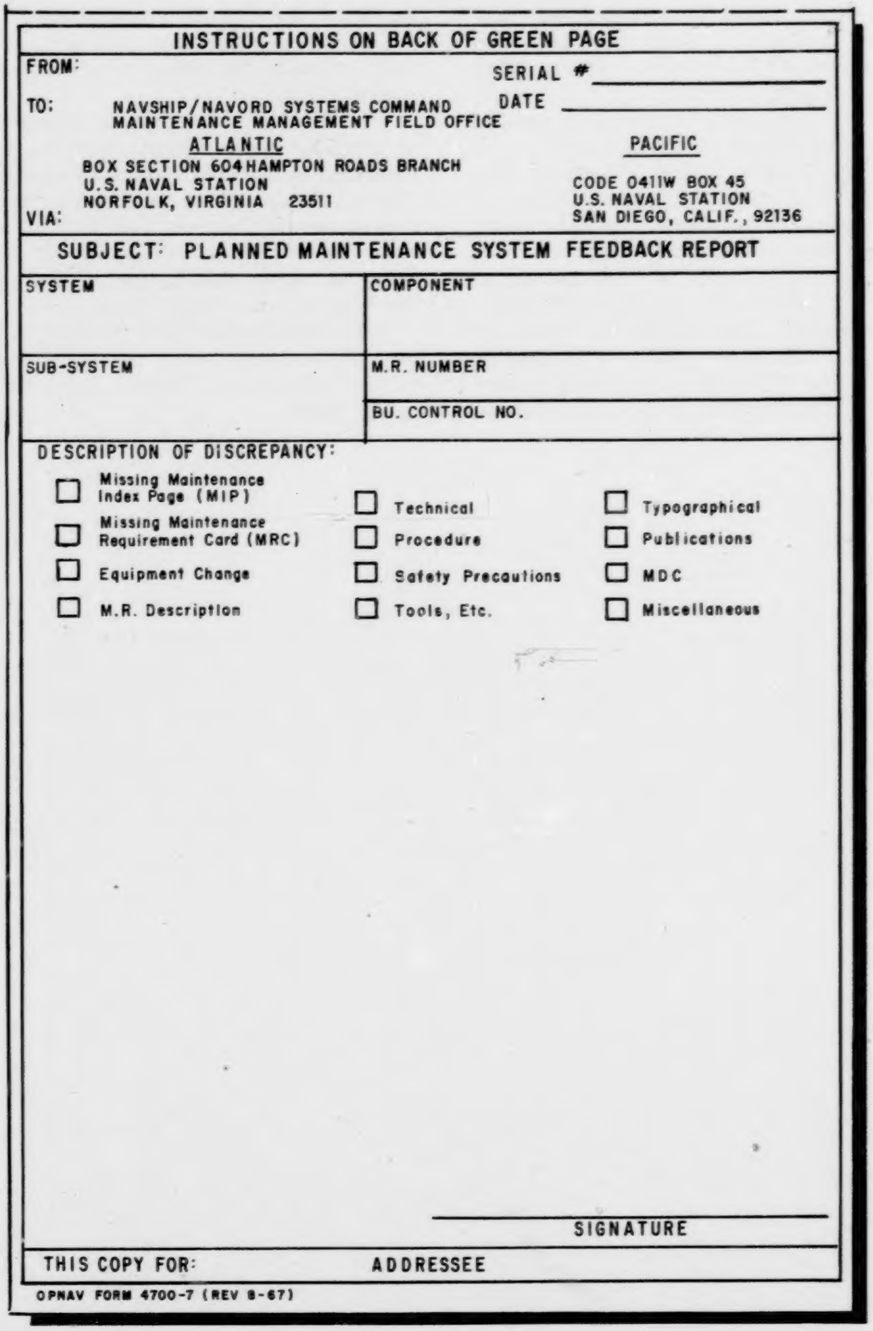
1. Type in the following basic information: Maintenance group components and MIP's in the same order as the cycle schedule, and the recurring daily and weekly maintenance requirements. The weekly schedule is then either laminated or covered with a clear plastic sheet.
2. Requirements scheduled for a specific week on the quarterly schedule are transposed to the weekly schedule cover sheet (insure that an even workload is attained).
3. Assign personnel to accomplish each task scheduled for the week.
4. Fill in the right-hand column with those preventive maintenance requirements due to be accomplished in the next month and known outstanding repairs on each component.
5. Post the weekly schedule in the work space holder provided. If the weekly schedule is not laminated, install a clear plastic cover in the holder.
6. The maintenance requirement number is crossed off when the maintenance is completed or is circled when the maintenance cannot be completed at the time scheduled.
7. The maintenance group supervisor reschedules all circled items during the week as his workload and ship operations allow.
8. The maintenance group supervisor fills in the column provided for outstanding repairs.
9. At the end of each week, the supervisor brings the quarterly schedule up to date by comparing it to the weekly schedule and by crossing out completed items and circling items not completed.
10. The old weekly schedule cover sheet is erased so that the maintenance group supervisor can prepare the new weekly schedule. (The weekly schedule is designed for convenient preparation and effective reuse.)

PMS FEEDBACK REPORT

Changes to MRC's and MIP's either in content or in frequency may sometimes appear desirable. The Maintenance Requirements Cards and Maintenance Index Pages are a responsibility of the cognizant Systems Command, and any recommended changes should be submitted on the PMS Feedback Report, Form OpNav 4700/7. (See fig. 6-5.)

Instructions for completing and submitting the PMS Feedback Report are printed on the back of the last copy of this five-part snapout form, and are partially listed as follows for the purpose of information:

1. Handwritten copies in ballpoint pen are acceptable; however, typewritten copies are recommended.
2. Check appropriate box in discrepancy section.



INSTRUCTIONS ON BACK OF GREEN PAGE

FROM:
SERIAL # ______________

TO: NAVSHIP/NAVORD SYSTEMS COMMAND
MAINTENANCE MANAGEMENT FIELD OFFICE
DATE ______________

ATLANTIC
BOX SECTION 604 HAMPTON ROADS BRANCH
U.S. NAVAL STATION
NORFOLK, VIRGINIA 23511

PACIFIC
CODE 0411W BOX 45
U.S. NAVAL STATION
SAN DIEGO, CALIF., 92136

VIA:

SUBJECT: PLANNED MAINTENANCE SYSTEM FEEDBACK REPORT

SYSTEM	COMPONENT
SUB-SYSTEM	M.R. NUMBER
	BU. CONTROL NO.

DESCRIPTION OF DISCREPANCY:

☐ Missing Maintenance Index Page (MIP)
☐ Missing Maintenance Requirement Card (MRC)
☐ Equipment Change
☐ M.R. Description
☐ Technical
☐ Procedure
☐ Safety Precautions
☐ Tools, Etc.
☐ Typographical
☐ Publications
☐ MDC
☐ Miscellaneous

SIGNATURE

THIS COPY FOR: ADDRESSEE

OPNAV FORM 4700-7 (REV 8-67)

AB.321

Figure 6-5.—PMS Feedback Report Form.

3. Use the space below the discrepancy categories for all comments. State what is wrong and the recommended corrective action. Give reason for the proposed change.

4. Distribution should be made as indicated at the bottom of each page of the form.

URGENT REPORTS. PMS Feedback Reports that call attention to MRC procedures or instructions which, if followed, would create a personnel or equipment hazard are considered URGENT, and should be communicated to the cognizant Systems Command by the fastest means available. The subject of these reports should be URGENT PMS FEEDBACK REPORTS (Symbol 4700/7). A followup report should be made and sent via normal channels to the Navy Maintenance Management Field Office (NMMFO) in each case wherein an urgent report is sent by other means (message, telephone, etc.).

The NMMFO screens all feedback reports concerning nontechnical subjects, and technical feedback is forwarded to the cognizant Systems Command by the NMMFO. The cognizant systems command should respond to urgent feedback reports (within 24 hours) to all holders of affected cards, and follow up with revised documentation where appropriate.

PMS Feedback Report Forms, OpNav 4700/7, may be ordered from the Navy supply system in accordance with Section II of NavSup Publication 2002.

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